

## US Electric Utilities & IPPs

### Coal Ash Regs: What Drives Costs? - Call Transcript

#### Equities

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#### Rising from the ashes: putting the puzzle together

In our latest call series on coal ash regulations, we emphasize a need to focus on not just the recently completed Coal Combustion Residual (CCR) rules, but also 'Effluent Limitation Guidelines' (ELGs), which are likely to be finalized in September of this year. Cost for most plants appears to be in the \$10's of millions per plant, assuming no substantial excavation is expected. We see FE's decision to potentially mothball its Mansfield plant for up to a couple years as the outlier.

#### CCR related spending already started; may peak in the next 3-5 years

Our latest conference call was with Chris Hardin, from CH2M HILL, focused on recently finalized Coal Combustion Residual (CCR) rules as well as the 'Effluent Limitation Guidelines' (ELGs) for coal plants which are forthcoming later this year. Our top level takeaway was that the final rules are still being interpreted by the utilities and State regulatory agencies alike; but that actual implementation by power plants of some measures has already started (North Carolina and the Midwest being ahead of the curve); and spending may peak in the next 3-5 years. In the near term, we think the main advantage of the final rules are more in terms of reduced uncertainty, and most consensus view is that the categorization of coal ash as non-hazardous (thus allowing for its beneficial reuse) is a major positive for the industry.

#### Base cost at a typical facility: \$100,000-\$300,000 per acre

The preference is to close in place; and many utilities believe they can do that and avoid the groundwater impacts. Chris estimates that the costs for in-place closure (assuming no significant groundwater impacts) is \$100,000-\$300,000 per acre – Chris estimates a typical small sized pond to be 20-80 acres; with larger ones being 100-200 acres (the ash content may be much lower). Additional costs may be a function of how wet or dry the ash pond is. In case of ground water impacts, when an ash pond may have to be excavated, the costs can be significantly higher: involving spend on impact-testing, and upgraded cover systems for closure of unlined CCR impoundments.

#### Structural integrity and extent of ground water impact will drive costs

In terms of costs, the near term spend may be on the stabilization of perimeter embankments as per the structural integrity requirements of the Final CCR Rule. Over the longer term, costs can be associated with issues around ground water impacts; while for active sites, closure for unlined ash impoundments, and design and installation of wastewater treatment plants may be the greatest pie of the spend. Impoundments will be required to close under the rules if they fail a location criteria/ground water contamination in excess of limits; or structural integrity issues. In case any of those limits are breached, closure needs to begin within 6 months.

#### Provision for citizen lawsuits introduces a degree of cost uncertainty

We have highlighted earlier our concerns for uncovering new risks/costs based on the need to record information and make it publicly available on the internet. Speakers on our earlier calls had highlighted that existing industry practices would most likely have already unearthed any significant difficult problems and the possibility of discovering a new major issue maybe low. However, we do reiterate that there is an element of uncertainty that this provision introduces in terms of accurate cost impact forecasting.

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## **ELGs: more complex than CCRs**

The Effluent Limitation Guidelines (ELGs) specifically addresses water and wastewater issues from within coal-fired power plants. Most coal facilities see both CCR and ELG issues as matter of coordination. The ELG guidelines are still proposals; the EPA expects more formalized publication in September of 2015. Chris mentioned on the call that although there are 3-4 options for a CCR closure; there may be 10-15 options for typical ELG compliance evaluation.

## **Who may be impacted by these rules?**

It's the heavy coal-generation utilities with older assets that are particularly 'vulnerable'. We suspect much of this spend will be treated as ratebase additions to existing coal plants – even for plants that are decommissioned, and also for ash ponds that are already 'closed'.

We see PUC treatment of spend as key, particularly for DUK as it moves through approval process. We see broader modest capex opportunities across many regulated utilities with significant coal.

Meanwhile, with Texas the largest generator of coal ash, and presence of higher-risk sites in many restructured states like IL and OH, we see many coal IPPs as exposed. We emphasize NRG and DYN are the most significantly exposed, with FE already indicating it may have to mothball its Mansfield plant, among the single largest plants in PJM, depending on the ability to continue using the Little Blue Run coal ash facility.

Lastly, AES's coal plant in Puerto Rico is specifically identified as potentially running afoul of regulations under its reuse program.

[Please click on the links below to read some of our other recent notes on CCR:](#)

[Digging into the Coal Ash Regs \(Incl. Call Transcript\)](#)

[A dash of Ash](#)

[Framing the Power Story amidst an Oily Backdrop \(we preview Coal Ash regs on page 1\)](#)

[Understanding Coal Ash for Coal Plants](#)

[Dissecting EPA's Coal Ash Wastewater Regs](#)

## Conference Call on Coal Ash Regs

*We present below highlights from our call with Chris Hardin, The Coal Combustion Practice Leader for CH2M HILL and an Industry Partner at the UNC Charlotte Energy Production Infrastructure Center (EPIC) - who has a total of 20-years of experience in coal ash management – to talk about both the EPA's recently finalized Coal Combustion Residual (CCR) rules as well as the forthcoming 'Effluent Limitation Guidelines' (ELGs) for Coal Plants later this year. The text below has been edited for grammar and to aid ease of reading. The transcript has been further edited to reflect clarifications by the speaker to improve clarity for readers.*

*A replay of the call can be accessed using the replay dial in details below:*

### **Replay Information (available until 2/19)**

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Julien Dumoulin: Good morning everyone. Thank you for joining us once again for our latest conference call. This time we're joined by Chris Hardin, Coal Combustion Practice Leader at CH2M HILL, and an industry partner at the UNC Charlotte Energy Production Infrastructure Center. He has got 20 years of experience in coal ash. We'll be looking to discuss both the coal combustion residual rules, as well as the lesser known but equally important effluent limitation guidelines set to be released later this year.

So with that, I'll let Chris run through his slides and give us a little bit of background before turning it over to Q&A - so good morning, Chris, and thank you for taking the time.

Chris Hardin: Thank you, Julien. Appreciate the opportunity to speak to a national audience. As indicated, I'm with CH2M HILL. I'm their CCR practice leader, and also do a lot of specialty research and applied research work at the Energy Production Infrastructure Center at UNC Charlotte.

I just want to get clear that I always have a disclaimer, because I am an engineer. This does not reflect the views of CH2M HILL or the Energy Production Infrastructure Center, and this is not a professional engineering presentation. This

is my views from experience - actually it's closer to 24 years experience working with coal ash.

We'll be looking at digging in primarily to the CCR rule, but then also kind of giving just an outlook into the overlap and influence with the **effluent guidelines that are still in the proposed form, expected out some time later in September of 2015, according to the EPA.**

What I'd like to do is point everybody back to the initial presentations that were given by some colleagues of mine, people I know, Danny Gray of Charah, and also Michael Nasi of Jackson Walker. They have a lot of good points about the final rule or how it's being applied, in their previous presentations, so I would put people back to them, and that's on the UBS Web page.

A few key observations is that it's still in process. This is on Page 3 of the presentation documents. It's still in the process of being interpreted and implemented by the electric power utilities. So even though it's promulgated, it's in a final form, but prior to final publication it's still in the process of being figured out by the state regulatory agencies and the electric utilities.

General observations and a few key details is what I'm going to focus on. You'll notice that the presentation I sent is fairly detailed, because the rule is detailed. But we're going to kind of hit the tops. So I won't cover every single point on every single slide, but folks can look at those afterwards and be able to review some of the details, and get a good handle on what's happening with the final CCR rule.

**The biggest thing that's positive I see is that it decreases uncertainty. The final rule coming out, at least in this form right now, decreases uncertainty and**

**clarifies the classification of coal ash and other coal combustion residuals.**

We'll talk about the potential impact on electric power utilities. And then also what's being considered for ash pond closures. That's the big question that's been coming out for years. And then also beneficial re-use by many coal combustion utilities. On the bottom of Slide 3 you'll also see that I emphasize we're only touching the top of the key details in this presentation and the Q&A afterwards.

On Page 4, I talk about Size of the Coal Ash or Combustion by-product. Coal combustion residuals or by-products is about the second largest waste stream in the US, behind municipal solid waste. Typically 30 to 40% is recycled every year. And there was tremendous uncertainty until recently over whether EPA was going to have a hazardous or non-hazardous designation of coal ash and other coal combustion by-products.

It could impact over 600 unlined impoundments for coal-fired power plants. It was initially proposed in a way which **had questions around whether it would be categorized as a hazardous waste - and that's what was really causing problems with the industry, was the uncertainty.**

Flipping over to Page 5, we look at the proposed effluent guidelines. At CH2M HILL, this is actually some of the work that's being done at the Energy Production Infrastructure Center - we're seeing more of an integrated approach toward compliance, where we work with the CCR rule and the ELGs.

**Like I said, the ELG rule has not been promulgated, so we don't know the full impact of that. But we do have the final CCR rule out right now, which is positive.**

What we're seeing with most of the coal-fired electric power facilities is they're trying to figure out the following three items -- how to handle coal combustion residuals at their active and to-be-closed plants, and also their long-term baseload plants; coordination with the ELGs to address the water and wastewater issues.

The other one, which is the siting regulation, is basically groundwater impacts, structural integrity, and the surface water regulatory impacts and issues that happen with the operation and maintenance of coal-fired power plants. Most electrical power utilities have been planning for this for years, and that includes the CCRs and the ELGs. It's just that it's a massive change.

Looking at Page 7, let's look at the significance of the rule. I don't think it can be underestimated with all the uncertainty; this was very positive. It settled a fairly large lawsuit between the environmental groups and industry groups that required a requested action from the EPA to put out a final rule.

**So one very positive thing in reducing uncertainty, I think, in many places is that we have a final rule. It's also, in my opinion, very positive because it removes the impediments to beneficial re-use by declaring coal ash as not hazardous.** And that was emphasized in some of the testimony after the rule was put out.

And it provides some clear guidelines for addressing the risk concerns of publicly traded utilities, which are naturally very conservative. There are still some uncertainties in the rules, but we do have more clarity than we've had in the last three or four years.

Flipping over, these are the key points of the CCR rule. I won't go into the details of all these, but I am going to hit

the tops of these items - is that state control and implementation, **it is a self-implementing rule by the electric power utilities**, with follow-up and putting into the state rules, which could take anywhere from one to two years.

**It is a state-run program - that's what the Subtitle D program is aiming to eventually establish. State run programs for CCR management that are influenced and guided by the Final Rule. There are minimum guidelines in the final rule, and that's a key item. We have some minimum guidelines of what's expected on a national level for handling CCRs and dealing with ash impoundments.**

**The effective date? We're saying within six months.** Of course that's being debated even now, and the question is when the final publication comes out. I think it's already slipped past the projected June deadline date, or June publication date.

The positive thing is that a Subtitle D program will eventually be a state-run program for both CCR landfills and CCR impoundments. That's very clear. And the question is how the programs will that be implemented on the state level.

**We have groundwater monitoring requirements in place 30 months after the rule, but there's also requirements sooner than that for actually getting the monitoring systems in place.** And we have specific groundwater triggers in section (257.101a) of the rule.

**Structural integrity requirements will be starting six months to two years after final rule publication.** It establishes clear guidelines for things like liquefaction and structural stability, very specific factors of safety that the industry and their engineers can look into. We also have

siting location requirements. There are some uncertainties with that, and I'll highlight those later on.

Composite liner for new facilities and existing facility upgrades, and also a public notification and recordkeeping and Internet posting requirement for a lot of the information, the location and groundwater information, that's cited in the rule.

And then there's a **special exemption for inactive units**. And that's really to try to get the electric power utilities to close down their older units, their older ash ponds, quicker. And there are some advantages to doing that.

If you look at Page 11 of the presentation, there are many things that are taken into consideration with the final CCR rule, and potentially the ELGs as they're implemented. You can see all the different issues that the coal-fired utilities are dealing with. And it's not just a matter of closing ash ponds or handling coal ash. It really has to do with how the whole plant is operated, and how our power is generated from these types of facilities.

On Page 12, there's some really good quotes here from the Congressional hearings. I won't go into these too much, but I will just highlight some of the key ones. There are some real clear questions that were asked by US Congress about how things would be implemented by the state or the federal – and which will rule when there's a conflict between state and federal guidelines.

What was also brought up was that we didn't have sufficient clarity as an industry about what needed to go on. And these were actual quotes -- and I would encourage everybody to dig into these quotes on the next couple of pages -- from Assistant EPA Administrator Stanislaus, because they really emphasize a few key points that the senators and the congressmen asked.



On Page 13, I'm just going to hit on one thing on the state. It's a good question. **If the state adopts the plan that the EPA approved and the utility implemented, there's no way they can be out of compliance with the federal statute, but they could be out of compliance with the state one if that has extra provisions.**

And Assistant Administrator Stanislaus said that is correct. So we got some fairly clear answers, but we also got a lot more gray areas from the testimony in front of Congress.

**Risk-based corrective actions is one of the things that they are emphasizing will continue. A lot of those are run by the states.** That's on the bottom of Page 13.

**One of the more troubling items that industry is still dealing with and was brought up at those hearings, is the retroactive application of locating siting restriction.** There's old coal ash ponds and old facilities, even closed ones, and would they be subject to the rule?

The industry would like more clarity, and frankly even the environmental groups would like more clarity on how the final rule will be implemented and when? What's the next step? We would expect some additional clarity coming from the EPA on that.

Specific things like older sites and landfills close to waterways; requirement of unlined impoundments that exceed groundwater standards; and the gray areas between inactive sites and unlined impoundments; what's considered inactive site / What's considered inactive unit? Those are all things that the industry and other stakeholder groups are also asking for clarity on.

The big item was the clarity between what rules when there's a conflict or uncertainty between state and federal rules, and which are the utilities required to follow.

Flipping over to Page 15, we look at some key questions. What I would highlight on this page right here is - **what's going to happen with the electric power utilities when everything goes out on the Internet? Would that provide additional uncertainty when groundwater results and everything are out on the Internet?** A lot of the public records are already out in the state regulatory Web pages, and to me that would not be as big a deal because it's information that's already out there in the public forum.

Another potential risk or remediation cost implication issue would be that groundwater monitoring wells are in initial stages of being planned or installed. What type of information will they bring up around ash impoundments? That's to be determined.

And the response of the state regulatory agencies, it could take anywhere from six months to two years for some state regulatory agencies to get the rules promulgated in the individual states. And also there's continued uncertainty and risk from potential abscissa lawsuits and permit violations.

**Areas of the rule with the greatest cost implications - short-term items would include the stabilization of some of the perimeter embankments and discharge spillways.** We had that at Dan River. Those are being addressed by many utilities proactively now.

They could trigger closure requirements within six months if some of these ash impoundments have items that conflict with the structural integrity requirements. That's in the final rule.

Longer-term items is what's going to happen with groundwater impacts. We're going to put monitoring wells around many of these facilities. They're required by the rule. And once again, not the inactive ones, but the active ones or ones that could be active. That could identify additional needs for corrective action. It could also influence the type of final cover system that would be installed.

**For active sites, the key would be the coordination of the unlined ash impoundments; design and installation of wastewater plants - that's what the effluent guidelines deal with; and to handle larger volumes of processed water and coal plant operations water.**

**Items that would trigger closure -- and these are the items that most utilities are looking into -- is if a unit has been sited improperly according to the new location restrictions, okay? If it cannot meet the location criteria, would a facility have to be relocated? We don't think that's going to be the case. But it's something that may need to be addressed.**

**For unlined impoundment, if they find groundwater contamination, why couldn't they enter into corrective action? That's one of the gray areas that was brought up at the Congressional hearings. And also if it cannot demonstrate minimum factors of safety, how soon will it have to close? And what needs to be done to close it?**

The key is, if one of these triggers go off, the owner and operator must initiate closure within six months. That's a pretty quick time frame.

On slide 17 we see items that can trigger ash impoundment closure. The items listed here are just a list of the existing

state and federal regulatory items or guidelines that already govern CCR impoundments; these comprise the basis for the final rule in many places.

On a practical side, **the grading and drainage required for ash basin closures tends to be the big item for CCR compliance.** One of the things we look at on a regular basis is whether there is availability of fill material around the CCR basin, the impoundment, to be able to cover the ash pond?

There also can be other site conditions and the potential for litigation that would push an electric power utility to excavate all ash ponds or some ash ponds. That would be an issue that would be more as a response to lawsuits. But in many places, we would see that simply covering those with soil or synthetic liner system, so we stop any groundwater impacts, would be sufficient. These are all considerations being made by the industry.

For active coal plants, what are they going to do? How are they going to continue to treat their wastewater? There's been a lot of discussion about putting wastewater treatment units on top of ash ponds. That is possible, but there are geotechnical conditions that need to be taken into consideration there.

And then you have the whole thing of protection of groundwater. And the big item there is leaching. **What's considered leaching from the CCRs? And what are the background levels that do not have to be treated? These are all things that are being looked at right now, and these can have tremendous cost applications. A lot of utilities are already looking into this and have been for many years.**

In Page 20, we look at the advantages of closing inactive units. There's a lot of discussion about that in the industry. I will tell you **there's a push to get as many units into the inactive clause where they would not be covered by**

**the final rule, because they're being closed.** That's actually one of the key provisions of the final rule that a lot of our clients are looking at.

On Page 21 we look at the beneficial use side. The question is when they're removed from a pond, what needs to be done to close the CCRs in place? Can they be encapsulated in place? Can they be put in a mine for reclamation? Can they continue to be used in highway applications? In large structural fills? Or for beneficial use in concrete and other products?

**That's all governed now by the encapsulation protocol which is, I think, very positive, because it starts to give us some detailed guidelines that the industry can follow,** as opposed to general ideas that may have been up for public debate.

If I look at what the **big concerns of the coal-fired utilities are, they're really making the decision about how to handle their older units; how to get them off the books as far as closures as quickly as possible.**

If they did not install the emission controls and are already in the process of being closed, how much can they use the inactive unit approach and close everything within three years, and get those out of being governed by the final CCR rule or state guidelines?

The next one is newer baseload plants. You see a lot of full-blown CCR and ELG compliance evaluations, wastewater treatment plant preliminary designs going on. And what you're seeing there is typically that the solution is to cover and line the CCR impoundments, install a full-service treatment plant to be able to handle the coal ash and FGD wastewaters. And those are fairly big operations, but those types of treatment plants are going to be required for the larger baseload plants.

The other thing is what I call plants on the bubble. **If it's going to cost too much to implement the CCR rule which is required, and the ELG rule which will be required for operating plants, some of these plants are going to close down.** And that's being determined right now. It has been considered for the last three years, and it will be determined over the next six to twelve months, to a year.

**The unexpected or hidden costs, what I would say on that are the structural integrity and the evaluations required for the liquefaction potential of wet ash materials. Those guidelines are still being developed.** So we have a rule that says they're required, but we don't know the geotechnical and technical requirements that EPA is going to require of the coal-fired power plants with their ash impoundments.

There are also additional impacts from **citizen lawsuits**, and I think we know there are several places across the country, and they can be asking for guidelines or for items that may or may not be in the final rule.

**In the end there is also the uncertainty or *timing of state implementation*. Many states are going to take, six months to two years to get these implemented. And that's definitely a gray area of uncertainty for the utilities.**

The only thing I'd emphasize on these last two pages is that **most electric power utilities have been looking at this for years - they've been preparing for this.** They've been planning. And I just have a list of questions I encourage everybody to look at, to know whether a utility is moving ahead.

The first question, does electric power facility have a CCR unit? Do they have a plan for closure and compliance with the ELGs? A lot of those are out on their public Web pages already. Is the electric power facility a percentage of beneficial reuse increasing or pushing higher to go ahead and recycle more of their CCRs?

**Is there pending litigation? If there's pending litigation, that can kind of be the wild card that can introduce more uncertainty into what a coal-fired utility's dealing with.**

And the last one is how many ash ponds are there to close. If there are inactive units of a typical coal fleet or their ash impoundments, how many of those could they get under the inactive clause or the inactive impoundment guidelines, to be able to close them out quickly? The quicker they get closed out, the sooner that risk is reduced.

Julien, that's pretty much it as far as my kind of initial presentation. Definitely open to questions.

Julien Dumoulin: Great. Excellent. Well thank you very much. I appreciate it, Chris. So let me just kick it off here with a few clear ones. I didn't hear you talk a lot about **cost. What is your expectation for an average coal plant?**

And perhaps describe when you encounter these coal plants and the eastern interconnects, what is their typical compliance situation today? What do they need to do? And what does that cost them? And by when do they need to spend that money?

Chris Hardin: **The cost, what I'm seeing for in-place closure assuming they don't have groundwater impacts so significant they would have to dig them out -- dig out the CCRs --**

**is \$100,00 to \$250,000, and up to \$300,000 per acre. There's low end on that and there's a high end on that.**

Plus there is also the cost of dewatering. If an ash pond is high and dry, it's going to cost less to close. If it's in a wetter area or has what we call water in capillary fringe, that can cost a lot more. Or if they do have to haul out a portion, that can add additional cost. I mean hauling, when you have to excavate an ash pond, that's where your costs can go up significantly.

Once again, \$100,000 to \$250,000 per acre - those are standard landfill closure costs; it's not much different than what we're seeing on the CCR ponds.

We're seeing across the board that, **where possible, the electric power utilities would prefer to close in place. And many utilities believe they can do that and avoid the groundwater impacts.**

The other side is **stabilization in place** – it is a well-established technique on other types of waste, even hazardous waste. It could easily be used for coal ash, and **could substantially reduce costs of having to possibly excavate place where there's groundwater impacts.**

**When? I can say this, that some utilities have already proactively started closing their ash ponds now.** And many, if not all, have been planning for years doing some of their initial engineering to go ahead and plan for the closures. They just didn't know which way it was going to go until they got the final rule.



But there will be a substantial amount of construction and remediation dollars spent in the next two to ten years. It's going to be a massive effort.

Julien Dumoulin: So just give us a sense here. If you were to say, \$100,000 an acre or \$200,000 an acre - how many acres is the typical size pond that you encounter, maybe on the large end and the small end?

Chris Hardin: Smaller units would be in the 20 to 80 acres for the ash ponds. The larger units (also with the larger base load plants) you'll see in some places 100, 200 acres of ash ponds. Once again, not all of them are filled with ash. A lot of the large polishing ponds do not have that much ash in it. So that's one thing people have to look at.

You've got your initial pond where you've been settling out the fly ash. But **just because you see 200 acres of ash ponds doesn't mean you have 200 acres of ash. That's a key distinction.** Then that portion, that polishing pond which may be half of a large facility, could be simply dredged out for the minor amount of ash in that pond and go ahead and clean-close it.

In that case they would not have the capping on the full portion or the whole ash pond system. Once again, they've been settling it out in the front end, a portion of it, and they've been polishing typically on the back end. That's why they have those large processing ponds.

Julien Dumoulin: Excellent. When you talk about the remediation dollars in aggregate, how big of a coal ash spend do you expect to see here? And where do you see those dollars concentrated - what kinds of units? What kinds of ash ponds? What regions are most impacted? Does it depend on the kind of coal burned? I mean just give us a framework here on how you think about the opportunity.

Chris Hardin: Yeah, well you do see the Midwest, because it has a lot of coal-fired units. You see a lot of those - the ash ponds are in the Midwest. There's also all over the South and Southeast.

The utilities will tell you how many coal-fired units and how many ash ponds they have - many of those are on their public Web pages now already.

But I would say you see the **Midwest and the South and the Southeast**. Coal-fired utilities have been about 40 to 50% of our electric generation capacity, and that's downgrading – so you're going to see a lot of those close down.

Julien Dumoulin: is there anything more significant? Such as, say, Illinois basin generates coal ash that is more difficult than the northern half or anything like that?

Chris Hardin: No. They've all got to be closed down. They're all going to be subject to the CCR rule as far as the closures.

Julien Dumoulin: Got it.

Chris Hardin: Separately, a vast majority have been using wet sluicing, which is when the majority coal fired plant wastewater is treated through the ash pond systems. **Some utilities have taken the lead in going over to dry handling. So they have ash ponds to close down, but they've already made the initial investment in their dry handling, so they're a little bit ahead of the curve.** So it's a whole series of options of making this transition from coal-fired power and wet sluice handling of wastewaters that is happening across the country.

Julien Dumoulin: You were talking about the coal combustion rules, the CCR that was finalized. Can you perhaps provide a complementary view to the ELG side of the world? So we've

got these two separate sets of rules. The ELGs, it seems could be material as well, perhaps tens of millions of dollars per plant?

Chris Hardin: Yes, there is a potential for that. I can't say any credible about the numbers for complete transition of coal fired power plants, and it's even more difficult with the ELGs. The numbers are more difficult to fix, and I wouldn't even venture into that at this time, partly because we have an uncertain rule.

We're at the place where a very few people would even talk about the implications, the cost of the CCR rule six months ago. **The ELG regulations, the final regulations, are not projected until September 2015.**

Until then, the utilities are working out the scope of work and digging in. They're ahead of the curve. But they don't know exactly what's going to apply. That's still being negotiated, the ELG regulations, just like it was with the final CCR rule.

So that's the place we're in with the effluent guidelines, regulations. They overlap with the closure of CCRs on these larger active plants, or even smaller active plants where they're going to be operating long term. You're going to have to look at the ELGs and the CCR rule to be able to get a good indication of cost.

Julien Dumoulin: And what's the timeline here? I mean generally speaking, it seems like it's not necessarily kind of immediate per se. It's going to be stretched out over some number of years. What's your expectation of when and how this gets done?

Chris Hardin: The CCR portion will start right away, and it's going to continue on. They're saying eight, ten, fifteen years out. And **you'll probably peak within the next three to five years**, because of the requirements in the final rule.

Julien Dumoulin: So from your perspective, when do you think the big dollars will start? Obviously they're starting right away on the engineering work. I mean when do the real capital dollars kind of get spent here, in your mind?

Chris Hardin: Talking about the guidelines as far as the timing for inactive ponds is concerned, then the spending could start now, because they're going to try to meet that three-year time frame. And we're seeing that already. **There are clients who have already been designing for their inactive sites.**

**Then your active ones, they'll do a design which could take the next six months to two years for engineering.**

And then they'll be looking at spending for the construction starting from about maybe two years out. There is an advantage to proactively closing portions of ponds, even on the large baseload plants. So we are seeing some movement in that area.

And obviously all the utilities like to stretch that spend out beginning earlier and stretch it out longer, so they can buffer it according to how much electricity they're producing.

Julien Dumoulin: Based on your rules (CCRs or the ELGs) what are your expectations for coal plant retirements? To what extent is CCR a liability that cannot be avoided, and would not necessarily trigger a coal plant to retire? Or could some of the liabilities be avoided by pushing some of these plants into retirement early, and avoiding this active versus an inactive plant consideration?

Chris Hardin: I would say the ones where the CCR rule are driving retirements - **they were going to be closing those anyway, because of the emission controls. The emission controls were driving the closures just as much as the CCR rule.**

The question is how much they were going to have to spend on those older plants during closure that they couldn't spend on keeping their newer emission-compliant plants operating. **I don't see the CCR rule necessarily pushing as many plants to closure that wouldn't have been closed.**

Coal plant closures are happening because of not just CCR, ELG and/or emission rules; but also because of the cheap price of natural gas.

Julien Dumoulin: What are the potential outcomes here in cost for the ELG side? What would ELG require to do, just to frame that? Just how do we bifurcate our understanding of CCR versus ELG?

Chris Hardin: If you can imagine this, **CCR is for dealing with the outside where the water was processed in the ash impoundments. With the ELGs, what you're doing is you're putting in a wastewater plant to deal with all the process waters that are necessary. These are large volumes of process waters for dealing with coal-fired electric power generation.**

So in the latter, you are talking about the inside of the plant. The analogy I've heard from some is that it's like you're replacing part of your intestine – so you're looking at the plant chemistry, the coal constituents, and the existing equipment.

So for example, space constraints. If a plant doesn't have any room to put a wastewater plant, that can be an item. Are there groundwater impacts or maybe a sensitive river nearby? That's going to require extremely high dollar wastewater treatment plants. The ELGs are dealing with the water, the liquid side, what comes off the coal-fired power plant.

And once again I'll say that I'm not an ELG expert. We have at- CH2M HILL several ELG experts, that's one of our strong suits. We are a water and wastewater company that also does environmental work. We have teams of specialists that are doing these ELG evaluations across the country right now with the coal-fired power utilities.

Julien Dumoulin: So just to understand, what does it mean when you say dealing with wastewaters? Why is it sensitive around rivers? What kinds of treatment would you need to do - I assume it's treatment of the water that is coming out of the plant that is the primary focus of ELGs, right?

Chris Hardin: Right. This is not water that's going to come from the dewatering of the ash ponds. But just the operation of a coal-fired power plant, which generates millions of gallons of wastewater.

All that wastewaters, depending on the type of coal that they're using, that can have a big impact. **They type of treatment they have to do to meet the requirements on the back end, it varies from plant to plant.**

And also this is much more complex. **We'll have three or four options for a CCR closure. There may be ten to fifteen options for typical ELG compliance evaluation, just to give you an idea. It's a much more complex evaluation.**

Julien Dumoulin: Is there any way to frame the cost conversation in a dollar per kilowatt there here? I mean so, tens of millions seems to suggest it's still probably less than \$100 per kilowatt all-in for one of these plants, and I know that's kind of an awkward way to frame it. But generally speaking, it's not hundreds of millions. It's tens of millions for a typical plant, all in, correct?

Chris Hardin: I tell you, I wouldn't even be able to venture into there. I'm an engineer, but I can say the complexity of that, I'm not a power plant engineer. And I know something about the

ELGs. I'm definitely not an ELG expert. I wouldn't even be able to venture into those areas.

But I can say this. The items that are being considered by the electric power utilities - and I have to say I've been impressed by the industry. They're digging in deep on this, which is what they need to do. And they've been doing a good job.

Julien Dumoulin: And from your perspective, where are we going to see the first action on CCRs?

Chris Hardin: It's happening in **North Carolina**, and that's very much out in the public record. And wouldn't want to go into it, but they are pushing for compliance around groundwater issues. The things that are being done with groundwater in North Carolina, things like that could potentially be happening in other states.

Another place that is ahead of the curve, there are several **states in the Midwest** - and I say this because they're mentioned in the CCR rule. The Ohio EPA was referenced. Some of their documents were referenced in the final CCR rule about ways to address some of the closure and structural integrity requirements. That's public record also, and there's parts of that in the final CCR rules.

(Questioner): Hi, Chris. Thanks so much for the presentation. Just had two quick engineering questions. For existing ash ponds, the rule considers that the unit is lined if there's a base of two feet of compacted soil with a specific hydraulic conductivity.

So I'm just wondering, from an engineering standpoint, how would that determination be made, given that the pond is full of coal ash and water. And then similarly, how would an engineer determine if an existing unlined pond had hydraulic connectivity with the uppermost aquifer?

Chris Hardin: Okay, good questions; it is obviously very technical. Typically that 2-foot clay and synthetic liner, that's what's called the

composite liner: that comes right from the MSW rule. It's the prescriptive liner that they took right out of the Subtitle D, Municipal Solid Waste rule.

They have just a few paragraphs in the final rule on this called the alternative liner system - and I know that some ash impoundments have put clay liners or maybe 1 foot of clay and synthetic liner that may not meet the full requirements of the composite liner in the final rule.

That would be worked out, I believe, on a state level with the alternative liner requirements of that state. The problem is the final CCR rule does not provide brackets and guidelines for working out what we call alternative liners. But the equivalency would be based on what's been used for years in designing equivalent liners for MSW landfills. This is my opinion on that.

(Questioner): So does that mean there would have to be a showing that when designed and built, that this was the way the pond was constructed, with that specific alternative liner?

Chris Hardin: When designed and built, and then what you saw - exactly what happened with MSW landfills that didn't have the full composite liner. Then there was some modelling - they would have to show that if you had a hole in the liner and it got to the clay, the equivalency of the permeability of the clay.

So yes, it would be in the records - and you'll see there's some sites that have detailed records. They went ahead three years ago and constructed composite-type liners and did the full CQA and testing, thinking that it could go this way. Some sites have it. Other sites just put the clay liner and the synthetic liner in, and didn't do any testing on it. That could be an issue.



But what's important in this is, even though there's a final rule guideline or a final rule regulation from the federal level, a lot of that according to the rule, will be implemented by the states. There's a strong emphasis in the rule that the states will be the partners with the federal government on this. In that area, I didn't see the rule becoming very prescriptive.

(Questioner): Okay, thank you. And the second part of my question was about unlined ponds. How would an engineer go about making the determination or demonstration that there was a hydraulic connection between the pond and the uppermost aquifer?

Chris Hardin: A lot of that is looking at preferential pathways and putting in a pretty extensive groundwater monitoring network - just like you would around any uncontained or contained municipal solid waste facility.

The question is the frequency of well spacing - that is noticeably absent from the final rule. What we're hearing is that it'll be worked out with the states. Some states have more prescriptive requirements just like they do for the Subtitle D MSW rule, Municipal Solid Waste rule.

My preference would be that issues around separation of groundwater would be worked out with the states. And many states - I would even say most states - have very clear guidelines on how those determinations are made.

Julien Dumoulin: Great. Here is a specific question - for a Bruce Mansfield or just generically any other similar plant -- how long does it take to put in place one of these dewatering facilities?

So in that particular example, the talk has been they're going to mothball the facility for a period of time in order to make the appropriate retrofits. The question is A, how long does that retrofit take, for a large plant like that?; and then

separately B, are you going to see other plants move to mothball themselves to make these retrofits? Or are you typically going to see them continue to operate through the entire CCR/ELG compliance phase?

Chris Hardin: What we're seeing is, it can take a year or more to design those, because these are big wastewater treatment plants. Once again, we're not dewatering the ash pond. That's just taking the wastewater from the plant.

I don't know if they've gone to dry handling there. If they haven't gone to dry handling, then you're going to have to do dry handling conversion and wastewater conversion. So you've got two things.

And then, **depending on the size of the plant, even fast-track, a minimum of two years** - maybe one and a half to be generous, to three years just to construct the plant. It's a pretty massive effort.

There is a mothballing or plant idling requirement or guideline in the CCR rule about plants being able to mothball to make transitions, and still be considered online. In other words, they're not full in a closure scenario.

Julien Dumoulin: Do you expect most plants to mothball for extended periods in order to make the retrofits? It doesn't seem like that would necessarily be the norm.

Chris Hardin: No. And there's other things they can do. They can separate off one part of the waste stream that maybe is problematic, and treat the other one in a different way and keep the plant operational.

They can allow a portion of the plant to operate and maybe have temporary wastewater treatment they can bring in and keep everything operating. If they get away from wet handling and they're already on that track, they may not need to do as much wastewater treatment.

So that's all the scenarios. That shows the complexity. I mean CCR ash pond closure we might consider two or three options. The wastewater and ELGs – that may throw up 15, 25, 30 options. There's a lot of different options that can be looked at with the ELG and wastewater.

(Questioner): Hey, I just want to ask you a couple questions about the way you described the state implementation aspect of this rule. From our understanding the rule and the way it's going to be laid out, it's going to be a separate federal rule that has its own implementation.

Whether the state picks up similar rules on a state basis - that will not void any of your obligations under the federal requirements. And the only way the federal rule is going to be implemented is through the citizen suits. So regardless of whether the state tries to modify their rules to match this, which I don't know that many states will even do that, this is going to be a complete separate federal rule with its own requirements and deadlines and obligations.

And the second thing that you talked about in your presentation, which I'm not certain is the way it's going to pan out - the way this federal rule, which I just indicated separate, is you would have to clean up to the groundwater protection standards. And the groundwater protection standards are at the edge of your facility, and some of them are background.

So there really isn't a true risk-based approach provided by the rule. And what you have to do for your state, which may allow that, is one thing. But you're going to have to comply with the federal rule as well. I don't know if you have any comments on that.

Chris Hardin: Actually you're dead on. There is confusion or unclarity in the final rule as written. This is the kind of detailed things that we're having to go through with specific plants. What I'm quoting from the EPA in the presentation, I'll call it, it's that's the information out of the EPA fact sheet. But then when you start to go in and actually have to talk about implementation, utilities have to implement it.

And this was one thing that was brought up right with the US Congress. There's a conflict. And the federal rule attempts to make it clear, but the implementation is not clear. The requirements of the final rule have to happen. But the EPA kind of passes the implementation on to the states.

(Questioner): Well I think they can't pass the implementation on to the states. The states can adopt it as part of their rules or not, but you still have complete separate compliance obligations, even though they may end up being the same in the end. They're complete separate compliance obligations.

Regardless of whatever the state does, you'll still have to post what's required to be posted on a public Web site. You'll still be subject to enforcement by citizen suits. So it may give you protection from those citizen suits, but it doesn't alleviate the obligations under the federal program.

Chris Hardin: You're 100% on - I didn't go into it, but that's the very questions that were brought up by the industry and other groups – you're going to need to implement both - but the federal overlay will rule.

And there's unclarity in how that will play out - but at the same time, it is a federal program that's required to be implemented by the utilities. So you're dead on. What you're saying – it is a problem with the way they're enforcing it.

(Questioner): Yeah, I just wanted to clarify that because, if you read your presentation, it seemed to infer that there could be a risk-

based approach under the rule, and that's not accurate; and that the states could implement it, and that's not accurate either.

Chris Hardin: Well there's parts in the rule that says they would allow risk-based things. But then when you get to the devil in the details of an individual site, what you're saying is exactly right. But using a broad brush, the EPA is saying that they'd still allow risk-based corrective action. But then when you talk about the practical side of it, implementing it with the MCLs and all that, that condition does not apply.

**And, that's a key point - that this is still being worked out. There are a lot of things that are very tough with what was not said or what was said in the rule. The other thing is that there is this citizen enforcement language throughout the rule, which was very unusual for how a rule from the EPA is written.**

Julien Dumoulin: Great. Excellent. I think we have topped the hour, so let's end this call on that note. Chris, thank you very much. Thank you much for the great questions here as well.

END

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