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The Tennessee Valley Authority's Kingston Ash Slide:
Evaluation of Potential Causes and Updates on Cleanup Efforts

Introduction

Chairwoman Johnson, Ranking Member Boozman, and members of the Committee. I appreciate this opportunity to provide an update to you on the progress we are making following the coal ash spill at the Tennessee Valley Authority's (TVA) Kingston Fossil Plant. We are working diligently to restore conditions in the Kingston community, and we have marked some important milestones in that recovery. We have also taken actions toward fulfilling our commitment to determine the root cause of the ash spill and to ensure that no similar incident occurs ever again at a TVA facility. In addition, we are incorporating the lessons learned from the Kingston spill into our management initiatives in order to improve TVA's performance and reputation. The recovery and remediation of the Kingston site is a long-term effort with implications for our nation's energy future.

Those of us at TVA appreciate the committee's interest in the ash spill at Kingston, and we particularly appreciate Chairwoman Johnson's visit to the site in early June to see the recovery work and meet personally with members of the Roane County community.

As you know, the incident occurred at Kingston Fossil Plant in Roane County, Tennessee, on December 22, 2008. On behalf of TVA, we deeply regret the failure of the ash storage facility dike, the damage to adjacent private property, and the impact to the environment. We are grateful that no one was injured. Since the time of the event, we have taken full responsibility for the clean up and recovery of the ash spill. We are doing the restoration work with the oversight of the U.S. Environmental Protection Agency (EPA), as well as the Tennessee Department of Environment & Conservation, and we are continuing to work closely with the Kingston community. The TVA Board of Directors is actively engaged in ensuring that TVA manages this work effectively and that we do so in a responsible and transparent manner.

TVA continues to be committed to protecting the health and safety of the public and site workers. Sadly, there was a fatality at the Kingston site on Monday, July 20. A contractor was unloading pipe for the dredging operation when the accident occurred. The circumstances of the accident are being fully investigated. All of us at TVA extend

our deepest condolences and sympathy to the family and friends of Mr. Larry LaCroix of Burlington, Iowa, and our thoughts and prayers are with them.

Today, I want to cover two things specifically: the cause and the recovery. This event was a wake-up call for TVA, and a failure in our commitment to TVA's mission to make the region a better place to live, work and raise a family. We are working hard to rebuild the public's trust. In the months since Kingston, we have taken aggressive action – from cleaning up the site, to instituting a comprehensive program to assess issues at our other sites. Although we have made good progress, our work is far from done, and I also want to discuss next steps with you as TVA undertakes a critical review of our overall organizational effectiveness.

First, allow me to address the more complicated item, and that is the cause of the Kingston failure.

Root Cause Analysis

Following the spill, we committed ourselves to determine what caused the failure and to prevent a similar event at any other TVA facility.

This work consists of a two-pronged approach, both technical and organizational in nature. On the technical side, our first priority was to engage a top-flight engineering firm to conduct a root-cause analysis to determine what happened on the night of the event. We also hired another highly regarded engineering firm to undertake a review of all of TVA's ash ponds at our 11 fossil plants and the now-closed Watts Bar plant.

Second, on the organizational side, the TVA Board of Directors commissioned the law firm of McKenna Long & Aldridge (MLA) to look at any management, controls and standards issues that may have contributed to the event and to make recommendations on culture and organizational effectiveness.

The root-cause analysis was conducted independently by AECOM Technology Corporation, a leading geotechnical engineering firm. I specifically asked TVA's General Counsel to select the contractor and administer the contract in order to provide as much independence as possible. I felt it was important that the Chief Operating Officer organization not run the analysis in order to maintain its focus on spill containment, restoration at Kingston, and a review of our other sites. In addition, it was important that the firm selected not have any previous involvement with TVA or its ash ponds.

The AECOM team is internationally respected in the fields of geotechnical engineering and forensic analysis; it brought to this project substantial experience in design, construction quality management, and forensic failure analyses of dikes,

containment ponds, landfills, and dams. In its forensic investigation of the Kingston failure, the AECOM engineering team took hundreds of soil borings and numerous core samples and performed extensive laboratory testing on the samples. The team also performed exploratory excavations; installed instrumentation; studied maps, photographs and surveys; analyzed relics from the coal ash release; reviewed design records and drawings; and interviewed TVA engineers and site operations personnel. The team then subjected its findings to peer review by a geotechnical consultant.

The study concludes that the ash spill was caused by an unusual combination of long-evolving conditions – the existence of an unusual bottom layer of ash and silt, the high water content of the wet ash, the increasing height of ash, and the construction of the sloping dikes over the wet ash. The analysis documents conditions at the Kingston site that date back to the plant's construction in the 1950s.

Throughout its work, AECOM shared information with the Tennessee Department of Environment & Conservation advisory work group which includes the independent consulting engineers retained by the Tennessee Department of Environment & Conservation, TVA's Office of Inspector General, and an EPA Representative. This group met several times to conduct workshops and review data as it was being collected and processed, and we encouraged all participants to raise any concerns about AECOM's analysis as that work proceeded.

Since the report was released, other points of view have been voiced. We remain open to new information about Kingston and will give the differing findings full consideration. We have carefully studied AECOM's report, and we believe it provides a thorough, well-documented, and appropriately reviewed assessment of the physical conditions that resulted in the failure of the ash dredge cell at Kingston and the mechanisms of that failure.

Actions and Accountability

TVA is carefully considering the findings in the AECOM report as we evaluate next steps for closing the failed dredge cell at Kingston and take actions to improve storage facilities at other TVA fossil plants. In addition to the root cause analysis, we moved quickly to establish a more comprehensive evaluation, inspection, and maintenance program to confirm that all of TVA's ash and gypsum storage facilities are – and remain – structurally sound.

That program encompasses three important aspects -- a review to determine the best storage method for each plant site, an organizational change to heighten our management focus on storage facilities, and the work begun in January by the engineering firm Stantec to assess all our facilities.

Overall, as we evaluate each of our coal-fired plant sites, we are determining the most effective and appropriate storage methods for each site. This requires us to evaluate a number of factors, from plant operations to the topography of each site. We are developing a plan to eliminate wet storage of fly ash at all of our facilities. (Currently, five of TVA's 10 other fossil plants use wet fly ash storage cells. The other five plants use a dry ash storage method).

With the organizational change, responsibility is consolidated for all storage ponds in our system in a specific organization that reports directly to our Chief Operating Officer. This new arrangement ensures that we have heightened management accountability and institutional focus on the engineering, operation, and maintenance of the storage facilities.

Stantec was commissioned in January to inspect, test, and make recommendations on ash and gypsum disposal facilities at all our fossil plants. Five teams of Stantec employees have visited all the TVA fossil plants, and initial results suggest no evidence of imminent failure at any TVA ash storage facility.

Stantec began its work with site walk-downs, reviews of available documentation, and detailed site reconnaissance. Stantec has made its initial recommendations, and we have been working aggressively to implement those maintenance and engineering changes over the past six months.

Stantec has completed 428 subsurface borings which represent 23,565 feet of total footage bored. Nine boring rigs are currently mobilized. Over 3,500 laboratory tests (for moisture content, composition, unit weight, compression and permeability) have been completed and 66 advanced tests (52 cone penetrometer tests and 14 shear vane tests to be used for stability modeling). The installation of 44 slope inclinometers has been completed to detect any slope movement along with 210 piezometers to measure water levels.

To date, 82,000 tons of rock have been applied to increase road and slope stability. Over 10,000 cubic yards of trees and vegetation have been removed to allow for better visual inspections of dike crest and slope conditions.

Subsequent work includes more engineering studies and analyses to further determine the structural integrity of each facility, complete geotechnical explorations, hydrologic/hydraulic analyses, and mitigation and conceptual designs. Stantec's Phase 1 reports have been released to EPA; the states of Tennessee, Alabama and Kentucky; and the public.

The arrangement with Stantec ultimately will provide us with better programmatic support for facility maintenance, improved annual inspections, and the application of more rigorous safety program standards to ash and gypsum facilities. The Tennessee Department of Environment & Conservation also has independent contractors looking at our sites in Tennessee, and we welcome any recommendations they may have.

In addition, in the interest of taking a conservative, self-critical approach, we have reassessed the potential hazard classifications of the wet storage coal combustion impoundments at each of our 11 fossil plants and the now-closed Watts Bar plant. Using criteria based on the National Dam Safety Guidelines, we evaluated the potential consequences of a worst-case failure of the wet storage impoundments. Although we have received no indications that any of our impoundments are in danger of failing, we have preliminarily reclassified impoundments at four of our 12 plant sites as having "High" hazard potential. We are prioritizing our efforts at these sites to ensure that the storage facilities remain safe, and we are continuing to focus on other impoundments, as well. We have communicated about this with EPA, the states where our coal plants are located, and the public.

Systems, Controls, Standards and Culture

One additional area we are addressing among TVA management and employees is the overall culture in our organization. Every day, around the clock, TVA employees are on the job, providing reliable, affordable electricity, managing the river system, and encouraging economic development in the region. TVA employees have a long-standing tradition of service to the Valley region, and I am proud to be one of them. Their diligent work on the Kingston recovery is an outstanding example of their dedication and spirit.

However, it is apparent that opportunities were missed for TVA to make changes to its practices that might have prevented the Kingston event. Decisions not to adopt dam safety guidelines for TVA ash ponds are an example of such opportunities. These missed opportunities are indicative of a larger cultural problem at TVA, in how all of us at

TVA think and act on risks; how we process and share information; and how we build a stronger sense of accountability in all we do. Culture has also been highlighted as a concern in the report conducted by McKenna Long & Aldridge (MLA) for TVA's Board of Directors, and I know is of concern to TVA's Inspector General as well.

MLA was specifically tasked by the TVA Board to look at the Kingston spill as a basis for improvement in TVA's management, systems and controls, yet another important step to prevent a similar event from ever occurring again. I have told TVA employees that the MLA report is tough, but good medicine and we take it because we know we can get better. While the descriptions of our shortcomings are not easy to hear, MLA findings and conclusions are another important milestone.

MLA addressed the fundamental question of system and culture failures around the Kingston spill and the management of TVA's other ponds. In sum, their review found that the necessary systems, controls and culture were not in place to effectively manage this important part of TVA's operations. Among the deficiencies noted are:

- lack of clarity and accountability for ultimate responsibility,
- lack of standardization, training and metrics,
- siloed responsibilities and poor communication,
- lack of checks and balances,
- lack of prevention priority and resources, and
- reactive instead of proactive approaches in lessons learned and safety.

Over time, and throughout TVA's 76 year history, an organization structure has evolved which was siloed with accountabilities dispersed throughout various units. With regard to ash management and storage in particular, these silos led to a lack of internal communication, sharing and follow-up on important issues. As a consequence, opportunities to anticipate or avoid problems may have been lost. With little sharing of information internally and no clear accountability, a culture was created in which the management, storage and disposal of coal ash and other combustion products were not seen as significant as other aspects of TVA's operations. Decisions made were not in keeping with a conservative approach to engineering and operations.

The Kingston incident has now focused a great deal of attention on engineering and operations at TVA. It also has focused our attention on opportunities to improve the rigor and discipline with which we approach every aspect of our work. Given the nature of our operations and the potential impacts to people and the environment, everything

we do requires vigilant attention to safety, procedures and regulations, as well as to regular inspecting, monitoring, and documenting of our work.

The MLA report points out that TVA has made 'significant remedial progress in relation to preventing any future pond spills,' and we appreciate their recognition of our work over the last few months. There is a cautionary note, however, from MLA that we take seriously. Legacy culture challenges exist at TVA, and our task going forward must be not simply to continue progress but to sustain that progress across the organization and over time.

The TVA culture must be one in which rigorous, disciplined adherence to standards is a way of life, and we are working to renew that aspect of TVA's culture. This is a problem we must fix.

As a result of these reports—AECOM, Stantec and MLA, along with the Inspector General's reports—we have several lessons learned about the challenges facing us, and I have summarized some of them, as follows:

- Storage facilities and structures should not be built in areas where stability cannot be assured and verified.
- Aggressive and rigorous inspections and structural analysis of all coal combustion product storage have been initiated and will be kept current.
- Management will visibly demonstrate and emphasize the need for self-assessments to promote objective and fact-based reporting, inspections and auditing.
- Safety related risks must be given the highest priority to identify, minimize and eliminate risks.
- Engineering design philosophy, design and construction of ash management facilities must be standardized.
- The handling, storage and disposal operations for coal combustion products must be standardized.

All of these lessons learned tie into a broader observation. It is apparent that lack of clarity within the organization led to poor internal communications, unclear accountability, a lack of follow-through on issues and poor procedural compliance.

As a consequence, it is imperative that TVA must have:

- Clear accountabilities,
- Strong governance,
- Robust self assessment

- Independent reviews for quality and compliance, and
- a culture of personal responsibility and problem solving.

At the Board's direction, we will initiate an agency-wide organizational effectiveness plan, focused on change management, performance and compliance. This is a high priority for us in the coming months as we rebuild and refocus our internal culture committed to systems, controls, standards, accountability, and an overall effort to address legacy culture challenges.

Progress Report: Recovery Operations

Now, to the second aspect of what I would like to cover today and that is our progress at Kingston, including recovery operations, environmental conditions and community outreach.

Every day since December 22, 2008, TVA crews and contractors have been on the job, working to correct conditions. While complete recovery is a long-term effort, I am glad to report that we have now worked with Roane County and local utilities to rebuild all roads and water lines, and all roads affected by the spill are now open to the public. The rail line initially covered by the spill was cleared and opened for use in January, and two new rail spurs have been built on the site for use in transporting ash from the spill to offsite disposal facilities. When Chairwoman Johnson visited the site, she was able to see some of the progress for herself, and I have a few slides to share with everyone here today:

- Church slough before and after ash recovery
- Emory River channel before and today after Dike 2 construction

In the recovery work, TVA has entered into an administrative order and agreement on consent with EPA to provide for EPA's oversight of the clean-up under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). We believe that applying the federal CERCLA requirements, with EPA oversight, to the Kingston site assures the public that TVA is carrying out all the response actions necessary to protect public health and the environment. The CERCLA process also provides a process for meaningful public input which we believe will be helpful with regard to response actions at this site. This arrangement brings to the cleanup work EPA's specialized expertise to better ensure that the work will be done expeditiously and in keeping with all federal and state environmental requirements.

The administrative order and agreement on consent with EPA continues the work among EPA, the Tennessee Department of Environment & Conservation, and TVA that began back in December; and we appreciate the sound working relationship in place at the site. TVA submits all of our work plans and schedules to EPA for review and approval, and EPA helps provide a meaningful approach to community involvement in the cleanup work. Our common goal is for the cleanup to meet the nation's highest standards for effectiveness, transparency, and public involvement.

As you know, we met a key milestone in mid-March when we began dredging operations to remove ash from the navigation channel of the Emory River. We are doing this work under a dredging plan approved by EPA and the Tennessee Department of Environment & Conservation to remove ash as safely and efficiently as possible in a manner that protects the public health and the environment. Water quality monitoring equipment has been placed in the river to continuously monitor water clarity and quality upstream and downstream of the dredging operation.

The work currently under way is the first phase of our dredging operations, which will partially clear the river channel to restore flow without disturbing legacy, natural river sediments. Future work to fully restore the river channel to its original depth will occur during the second phase of dredging.

At this time, we are using barges with hydraulic dredges along with piping to move the dredged material back onto the plant site. A barge also will be used to remove any debris that is found as dredging progresses, such as large rocks, trees, limbs, and other items that may be submerged in the river.

We are taking steps to minimize inconveniences to residents of the area, including installing special noise reduction equipment on the diesel engines, pumps, and compressors and devices to reduce the glare of lighting at night.

To date, we have dredged or excavated almost half a million cubic yards of ash at a peak rate of about 12,500 cubic yards a day. By mid-August, we will be operating two dredges at the site, with an expected capacity to dredge as much as 20,000 cubic yards of ash per day. We estimate 3 million cubic yards of ash recovered from the Emory River will be removed over the next 12 months.

The second major milestone we recently met was making the first rail shipments of dredged ash from the site to a permanent disposal site. This important step was approved by EPA, which requires any storage facility we use for the coal ash to meet the most stringent protective disposal standards for municipal solid waste landfills.

TVA received and rigorously evaluated about 25 proposals before selecting the Arrowhead Landfill in Perry County, Alabama, as the site. The Arrowhead Landfill is a state-of-the-art, fully permitted, state-regulated, Subtitle D municipal solid waste landfill and has been operating since 2007. It is in Uniontown, Perry County, Alabama, and is managed by Phillips & Jordan. The Arrowhead Landfill meets and exceeds EPA's requirements, as adopted by the Alabama Department of Environmental Management. TVA's evaluation of proposals from companies interested in receiving the ash shipments included a comprehensive examination of numerous loading, transportation, and disposal options and approaches.

During transport, the moisture content of the ash, along with a number of handling and transportation safeguards, helps ensure that ash does not become air borne during loading and shipment. At the landfill site, the fly ash is stored separately from the other material there. The composite liner system at the landfill consists of 2 feet of compacted clay, overlain by a geo-membrane liner, which is overlain by a 2-foot thick drainage layer.

Before the shipments to Perry County began, the landfill had five full-time employees. Its operators now expect to hire 40 to 50 new local employees to manage the fly ash disposal at full production. Tipping fees for the disposal in the Arrowhead Landfill will generate revenue for Perry County.

To ensure a good working relationship with the Perry County community, senior members of TVA's staff met with community leaders and elected city and county officials and visited businesses and schools in the community. TVA also hosted a meeting of Perry County officials at the Kingston Fossil Plant to provide information on the production and characteristics of coal-combustion by-products, particularly fly ash. We are sensitive to the concerns raised by community members and are continuing to work locally to address them.

Progress Report: Environmental Conditions

Our highest priority continues to be the health and safety of the public and employees. We are continuing the ongoing and comprehensive monitoring of air and water samples in and around the site, and environmental monitoring will continue long-term, after site cleanup is complete.

Results of extensive water-testing by multiple agencies show that public and private water supplies continue to meet drinking water standards. Results from more

than 71,000 air samples taken to date confirm that levels of particulate matter and metals remain below national and state standards, and we are continuing measures to suppress dust and prevent ash from becoming airborne. While samples of the ash itself show that most metals in the ash are similar to those found in natural soils in the area, we continue to recommend that the public avoid contact with ash. Additionally, we have instituted more stringent practices to ensure that ash does not leave the site on trucks and other equipment or apparel, such as workers' boots.

In addition to the many certified lab results now on the record, some other environmental data has been discussed by a variety of groups since the spill, and the data is described as differing from the findings of the independent labs used by TVA and the Tennessee Department of Environment & Conservation. TVA takes these reports seriously, and we are interested in any information with the potential to affect public health and the environment. When we hear of these reports, we make every effort to review the findings to further ensure that our monitoring procedures are thorough and accurate. An interagency working group of state, federal, and industry experts assists in evaluating the data from monitoring and identifying actions necessary to ensure the protection of the public health and the environment.

At the same time, TVA recognizes that local residents have health questions and concerns. The health and safety of the people living near the Kingston site are of primary concern to the TVA, and we have contracted with Oak Ridge Associated Universities (ORAU) to provide independent health screening for residents living near the ash release.

ORAU is a university consortium with access to the expertise of 100 major research institutions. Working in conjunction with physicians from Vanderbilt University, ORAU is developing a medical evaluation protocol for local residents. ORAU will implement a process that provides access to medical and toxicology experts knowledgeable in the health effects related to contaminants. ORAU also will work with local physicians to provide them with information and support to address their patients' concerns. ORAU is solely responsible for developing the health assessment protocols and subsequent medical evaluations. TVA will not have access to any confidential medical records or names of individuals who have health evaluations; TVA will receive summary reports on progress, including the number of participants and trends. Information about the program is being provided to local residents directly from ORAU.

TVA is also working with ORAU to provide $3 million over three years to support peer-reviewed research that will help everyone better understand the properties of coal combustion by-products and develop technology for using them. This includes identifying alternative ways to contain, handle, and process by-products, characterizing their properties so that more by-products can be reused, and better understanding the effects of coal fly ash releases into the environment. While TVA is funding the effort, ORAU is managing the independent proposal review and grant process that will benefit the public and industry. Eligibility for the funding is open to colleges and universities, research institutions, private companies and qualified individual researchers.

Progress Report: Community Outreach

As I mentioned, we are grateful that no one was injured when the spill took place. When the incident happened, we immediately began reaching out to local residents, and the people most affected by the spill have continued to be our priority. We are working closely with local residents and public officials and the Roane County Long-term Recovery Committee. We hosted our first open house in the area in January with representatives from key state and federal agencies. We have also hosted two other public meetings and participated in numerous homeowner and community meetings, events, and presentations.

The community outreach center in Kingston has worked with almost 750 families to address their questions, concerns and property damage claims. The center also provides information about the Kingston recovery. We are working hard to be responsive and responsible as we address property owners' claims, and we appreciate the patience of the property owners as we have worked through this process. As I mentioned, the released ash covered about 300 acres, of which eight acres were privately owned lands, not owned or managed by TVA. Within the first month, TVA began purchasing affected properties, using appraisals by state-certified residential and general appraisers. Offers were made based on the higher of two independent appraisals. The appraisals are based on property values as of December 20, 2008, before the spill. TVA has purchased more than 125 pieces of property, a total of about 440 acres. We have also assured local officials that Roane County property tax revenues will not be negatively affected by the purchase of these properties.

As we make progress toward setting things right in the Kingston community, however, some area residents, and even some people well outside Roane County, have

determined that legal action is how they should deal with TVA and the Kingston ash spill. In that vein, TVA must defend itself against the lawsuits that have been filed by numerous law firms seeking millions of dollars for multiple plaintiffs, including some people who live dozens of miles from the site.

At this point, TVA has a two-fold responsibility. First, we must continue to clean up the spill, recover the ash both from property and from the Emory River, and ultimately restore the area. We are working hard and making significant progress on that front. Second, we also have a responsibility to be good financial stewards for the 9 million ratepayers of the Tennessee Valley. TVA must defend itself against these multiple lawsuits. This is an important balance to maintain.

Under the difficult circumstances resulting from this incident, we have been gratified that our employees have had some bright spots in their work. Some members of the Kingston community have taken the time to write and tell us they know the positive difference TVA makes in the region and that they know we will fix this. Some residents have told us they appreciate the courtesy and attention they have received at the community outreach center and that employees there have often gone the "extra mile" to address their concerns. We appreciate these expressions of confidence, and please be assured that we will continue to live up to them.

Conclusion

Since the day the Kingston spill occurred, we have been in close contact with local, state, and federal officials; residents of the Kingston community; and members of the public in the immediate area and elsewhere. We appreciate the oversight of this committee as we recover the Kingston site and take action to ensure that such an incident does not occur again.

We take seriously the lessons learned from Kingston and are incorporating them into our management initiatives to improve TVA's performance and reputation. Others in the electric utility industry share our interest and yours in understanding how and why this occurred and what additional measures are needed to avoid any similar occurrence. This is a costly learning experience for us, and it is a learning experience for the entire industry, as well. As we work through this, new questions, concerns, and issues continue to emerge. We are anticipating those to the best of our ability and addressing them responsibly as they develop. We are also calling upon the best industry resources to provide their engineering and environmental expertise.

Long-term, we are also considering the role that coal plays in our power generating portfolio. The Kingston clean-up itself is costly, and moving from wet storage to dry storage of coal combustion by-products across the fossil fleet will be expensive, as well. If the conversion to dry storage is not economically feasible at some sites, we will have to consider retiring some facilities.

We have a goal to increase the amount of carbon-free generation we use, and we have begun an update of our integrated resource plan that looks at all energy resource options over the next two decades. The move to more carbon-free resources to meet current and future power needs will require TVA to make significant capital investments in new generation.

TVA remains committed to continuous improvement, a culture of accountability, accuracy of information, and responsiveness to those who provide oversight and guidance to TVA. We are also committed to being a national leader in technological innovation, low cost power, environmental stewardship and economic development, remaining loyal to TVA's historic mission.

Thank you for the opportunity to provide this report on the progress we are making in our recovery work, and I look forward to your questions.