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Technical Focus, Energy & Environmental Committee Meetings

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M I N U T E S

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TECHNICAL FOCUS GROUP SESSION
Ajay Kasarabada, Black & Veatch Corporation, *Technical Committee Chairman*
Todd Young, HDR, *Technical Committee Co-Chairman*

Opportunities Provided by Internet of Things (IoT) for Industrial Energy Market

Ajay Kasarabada, Black & Veatch Corporation, pointed out that the Internet of Things is relatively new for industrial applications. The IoT is a global infrastructure for the information society, enabling advanced services by interconnecting things based on existing an evolving interoperable information and communication technologies. The IoT enables smart integration of physical and virtual systems. The layers include sensors, infrastructure, and embedded processing. The things being measured and controlled is the infrastructure. Devices and sensors collect the data. The data movement results from the connectivity. The embedded processing analyzes the data and makes decisions. The data is stored. Ultimately, system optimization and control takes place.

Key issues include aging infrastructure, aging workforce, operation efficiency, sustainability, tight margins, new business models, volatile markets and supply chains, new technologies, energy management, and distributed energy infrastructure. Distributed objectives and constraints must be managed in a complex dynamic environment. The opportunities include asset and product tracking, control room consolidation, advanced monitoring and diagnostics, autonomous robots, and augmented reality. The challenges include cyber security, return on investment, integration of new technology with old equipment, social optics, and potential job losses. Of these, cyber security is the biggest concern. Once data is being transmitted it can be hacked. Advanced monitoring and diagnostics represents the low hanging fruit and is being used today.

Rinol Pereira, ABB, Inc., reported on collaborative operations. Symphony Plus is a distributed control system that is offered for power plant control. ABB, Inc. is a leader in robotics. Robots are being programed with artificial intelligence so that it can collaborate with humans. Traditionally operations were organized into silos of performance. We are currently working with connected operations. We can connect things together via the internet. Next in line is collaborative operations, followed by remote operations. The final goal is to have autonomous control systems. With automated systems, the goal is to free up operators so that they can do more things and be more productive. Again, the layering starts with improved devices and sensors. The next layer is the

automation systems. These can be advanced to enterprise level solutions. At the top is open access through cloud computing.

The security aspects are divided into layers of control. The customer can control what data is made available outside of the system and when that data is actually sent. Eventually, these cloud based systems will be able to connect with each other. Collaborative operations involves integrating the collective data that goes to the company HQ with a collaborations center that provides 24/7 monitoring as well as access to "expert" systems. With this capability, problem resolution can be accelerated by bringing expert know how to the problem via the collaborative operations center. A compressor or motor problem at a site can provide the operating information to an expert somewhere in the world for analysis and resolution without having to bring the expert to the site.

While equipment issues are the most common application, the concept can be applied all the way up through the layers to the top layer of integration and analysis. Marine operations are one major application. Vessels at sea are difficult for real time maintenance. Mine safety is another near term application. Refineries and paper mills are starting to utilize the technology. The applications for these systems can be selected by the customer. The backbone system is common to all, so that over time, customers can add to the system.

With today's computing capability, equipment can be "twinned" digitally. A digital twin is a model that essentially duplicates the operation and performance of a piece of equipment. For condition assessment, an audit of the equipment is performed prior to initiating the collaborative program, including cyber security issues. This approach allows for predictive maintenance. Emissions monitoring is another area where such a system can be implemented. Emissions data can be smoothly translated into required reports in the required format for compliance. Safety management is another layer of collaboration. Alarm management can assist the operator in focusing on the most important equipment. Partnerships with appropriate applications (cloud programming, cyber system protection, virtual networking, etc.) is needed to assure that the appropriate systems can be applied.

Denis Oravec AAI-JMP Engineering, reported on energy monitoring for plants. The Industrial Internet of Things brings together the plant level operations connected to each other and the enterprise level to provide more optimized performance. There will be some standards in the future to ease the problem of these systems being able to communicate with each other. Cisco has estimated that there is $3.8 trillion in potential savings in the global manufacturing part of industry. The integration of information technology and operations technology can be used to optimize performance of the total system.

For cyber security, multiple levels are deployed with multiple fire walls to protect the data and the equipment. Network Architecture and infrastructure assessment is the first step. If throughput is to be improved the equipment has to be capable of handing the increased output. Productivity and quality can be improved. The control moves from static, fixed control rooms to mobile platforms, control from anywhere.

For one auto manufacturing plant, the cost of energy and utilities was to be reduced. A comprehensive energy management system was required to bring together all of the disparate information embodied in energy consumers in the plant. The starting point was a limited monthly report after the fact. A requirements definition and network study was carried out to make sure that

the relevant data was being collected. The existing Rockwell PLC hardware was utilized. An Ethernet based metering system was used. Nearly 1000 consumers (meters) were integrated into the system.

The system went into operation in 2014. Multiple examples of energy savings were recognized. A double digit ROI was realized on a $45 million/yr energy bill. Improvement projects were recognized that could be subsequently funded and implemented to the tune of $10 million. Operations can now be compared from shift to shift and from plant to plant. For energy savings, an energy champion is needed.

Advances in computer graphics and capabilities has enabled a lot more measurement capability and data management ever before. Assets include plants, machinery, property, vehicles, buildings, and other high value equipment. Machine learning is a type of artificial intelligence that allows a computer to analyze tremendous quantities of data and discover patterns. From these patterns, predictive outcomes can be determined. From these, the machine "learns" how a particular piece of machinery or equipment and then describe how that item actually operates.

Reactive maintenance is essentially operate to failure. Preventive maintenance works to a fixed schedule. Predictive maintenance is done based on the operation of the piece of equipment and its actual condition. Proactive maintenance examines the potential cause of failures and provides operating instructions that leads to fewer failures. EPRI studies indicate that proactive maintenance programs are 2/3 of the cost of reactive maintenance. The architecture is layered to provide several levels of local data and data analysis.

Only the reduced and compressed data that is needed is sent to the cloud. The cloud application can be public or private. Again, multiple firewalls are installed between the layers to protect the data.

Benefits include reduced equipment downtime, increased labor utilization, reduced inventory needs, and better asset utilization. Many legacy devices are not built for interconnected IIoT. Cyber-attack "surface" increases with the increased number of connected devices. Greater potential for breaches occurs when expanding IT systems. Physical harm is possible when IoT is used to control physical assets. Cyber espionage is possible against the various forms of intellectual property.

For asset management, it is important not to rush the planning process. All stakeholders should be engaged. A capable vendor is required. An inventory and condition assessment should be carried out. A risk assessment is also needed. It is a good idea to start with a pilot project. With the changing conditions in the world, continuous improvement will be needed. For security purposes, it is a good idea to segment the systems. The internal network should be monitored for anomalies. Unnecessary connections should be avoided. Threat intelligence should be included in the monitoring system. Strong passwords should be used. Over 80% of hacks involve easy to break passwords.

Doug Cowin, Stanley Consultants, reported on today's asset management approaches. Asset management involves coordinated planning, asset selection, acquisition, development, utilization, maintenance, renewal, and disposal of assets. Critical assets are those that have the greatest potential to impact a company's strategic plans. This is being accomplished through the combination of automation, operational technology, "big data", and "smart systems" (artificial intelligence).

Machine learning is a form of artificial intelligence that involves software that learns from operating data and is able to predict outcomes as a result. Reactive maintenance is the traditional "run till it breaks" approach. Preventive maintenance uses scheduled maintenance based on experience to avoid failures. Predictive maintenance takes that experience into account by keeping track of the actual operating condition of the machine. Proactive maintenance focuses on root cause analysis to eliminate failures and is an advanced form of condition based maintenance. Annual average maintenance costs are reduced as the number of failures decreases. The Industrial Internet of Things IoT facilities to practice predictive and proactive maintenance.

IBM claims that IoT systems will reduce equipment downtime, increase labor utilization, reduce inventory needs, and increase asset utilization. McKinsey and DOE make similar claims. Security is a major issue. The more things that are connected to the internet, the more possibilities for attack exists. The facility networks should be segmented and monitored for abnormal behavior. Unnecessary connections to the internet should be eliminated. Threat intelligence should be incorporated into the systems. Very strong passwords should be used.

GOVERNMENT AFFAIRS SESSION

Anthony Reed, Archer Daniels Midland Company, *Government Affairs Committee Chairman*

John Hughes, ELCON, reported on the goings on at the FERC. The Trump Administration has been rather slow to get appointments at the various agencies so that decisions could not be taken. The FERC was one of those agencies and only recently got enough appointments to gain a quorum. This is important as many pipeline approvals have to go through FERC. The utility industry is undergoing a major change in the resource mix. In the past, the amount of large base loaded power generation provided a flywheel effect for grid support to maintain automatic frequency control (AFC) on the system (i.e. 60 cycle AC power). What used to be called ancillary services (frequency response, ramping, and voltage) are now referred to as essential reliability services.

The DOE prepared a grid reliability report to look at the impact of renewables and environmental regulations on the grid. Cheap natural gas, weak demand, and more renewables have had a negative impact on existing coal fired units. System reliability and resilience are key features that need additional recognition to maintain the grid system.

The original intent of "resiliency" was to "harden" the grid such that "black swan" events would have limited impact on the system. The concerns about the conclusions from the report are that the report appears to want to justify support for base loaded coal and nuclear plants. One of the key services is the frequency control. The North American system is a 60 Hz system (60 cycles/sec). Grid operators want to keep the entire system at 60 Hz with only a very small tolerance. Wind and solar do not generate 60 Hz power.

The FERC has ordered that all generators have some kind of frequency control. This has an impact on cogenerators, not only the renewables. CHP units that are "sized to the load" will not likely be able to comply with the frequency control mandate. There is a House Energy bill that is aimed at having the ISO/RTO do a study on frequency control and grid services. There is also a section on resilience. There is a Senate bill that has sections on grid security, storage, grid architecture, hybrid micro grid systems, performance metrics, voluntary state/local programs, and various reporting requirements.

One requirement would be that all new generating installations would have to file a grid reliability impact statement.

Anthony Reed, Archer Daniels Midland Company, reported on some of the activities in Washington. Some of the issues include the debt deal, disaster spending, nominations/confirmations, deadlines, taxes, healthcare, infrastructure, and Congressional elections in 2018. On the debt deal, the debt limit was suspended to Dec. 8th by a deal between President Trump and the Democratic Leadership. Of the 1,200 presidential appointment positions some 599 are key positions. Of these, 153 have been nominated and 117 confirmed. There are 320 that have not been nominated. There are roughly 5 positions in each agency that have to be nominated (Secretary, Deputy Secretary, General Counsel, Under Secretary, and Assistant Secretary). For Under Secretary and Assistant Secretary, there are several positions in each agency (i.e. Air, Water, Solid, Enforcement, etc.).

Deadlines include disaster spending, S-Chip funding, FAA reauthorization, flood insurance reauthorization, and healthcare reconciliation (avoids the 60 vote requirement). In December, the debt limit and immigration will come due. In addition to all of those, nominations have to be handled. Tax reform is being pushed for this year. Energy issues are likely to be put off to 2018. Off year elections (midterm) tend to favor the party that lost the presidential election. This is particularly true when the president's approval rating is low. With a poor rating, both the House and the Senate could conceivably flip to the Democrats.

ENERGY SESSION

Frederick (Fred) P. Fendt, The Dow Chemical Company, *Energy Committee Chairman*
Robin Mills Ridgway, **Purdue University**, *Energy Committee Vice-Chairman*

Travis Fisher, DOE, was to provide a review of the recent Electric Markets and Reliability report for which he was a principal author. However, he was called to a hearing and was not able to present. He will be invited to a future meeting on this topic.

ENVIRONMENTAL COMMITTEE SESSION

Chuck Hallier, Cargill Incorporated, *Environmental Committee Chairman*
Robert (Rob) Kaufmann, **Koch Companies Public Sector, LLC**, *Environmental Committee, Vice-Chairman*

Juan Parra, EPA, provided an update on the Combined Air Emissions Release Inventory Program. EPA began discussions began updating its reporting programs in 2015. EPA has been working with states and tribes to improve and modernize its business practices. The idea is to have one reporting system for all of EPA's reporting requirements. This is supposed to reduce the reporting burden on industry. The focus is on point sources.

The 4 programs included the Toxic Release Inventory, the GHG Reporting Program, CEDRI, and the National Emissions Inventory. There are some differences in the types of data and the definitions under these programs. No new emissions requirements are intended. The goal is to provide an estimated $20 million/yr savings to industry through centralized reporting.

Information specialists were engaged by the air staff to identify processes that could help streamline the system. Workshops and webinars have been held to provide feedback to the program. There is

considerable diversity in state requirements and reporting systems. Changes and implementation costs were a major concern of all stakeholders.

TRI and GHG reporting are direct reporting systems. CEDRI has its own reporting requirements for source testing. The NEI process is separate from everything else. There are a number of different login requirements for state reporting systems. Multiple parameters are often reported at both the state and federal reporting systems. Often there are multiple places where facility attributes can be updated and the required data be input. Here, once the data has been input, the required information will be automatically delivered to the 4 federal programs and the appropriate state programs. One common form will be appropriately populated and will serve to provide the information required from the various programs. Something as simple as a facility name change would only need to be input once to the common form. This information will then be sent to all of the appropriate reporting programs.

New information can be input by the facility. An EPA or state "steward" would validate the change. The emissions data would then be input to the common form. The software would then distribute the information to the appropriate program. The first sector to try this program will be the plywood sector. There is also a risk team that will look at air modeling information for risk assessment. A facility "widget" would have a "Google Map" type picture of the facility and include location, plant equipment, and release points. Sub facility units can also be created. A prototype "widget" is supposed to be available by the end of the year.

The implementation plan envisions a multi-year process. The first round projects are expected this year. There are 5 product design teams for the first round projects. As an example, the National Emissions Inventory requires reporting on the 6 criterial pollutants and the 187 HAPs. The Toxic Release Inventory requires HAP reporting as well as lead, one of the criteria pollutants. Thus HAP reporting is required twice for these programs. Further, the MACT rules require HAP reporting in CEDRI. The new program will allow the information to be input once. The program is currently only for air emissions. A longer term goal might be a single form for all reporting.

Bernie Evans, Environmental Resource Management, reported on the refinery fence line monitoring rule. The concern on the part of EPA is fugitive emissions. EPA's next generation enforcement program is to get citizens, or citizens groups, to help monitor ambient air, especially around plants. Inside the plant fence line is "plant air". Outside the fence line is ambient air. There is an ambient air monitoring network, but this network is limited and expensive. Additional monitoring by other procedures provides additional data, but of lessor quality than the ambient monitoring network.

There are a number of low cost ambient sensors that are available. The accuracy of these instruments is considerably less than the requirements for the instruments that have to report emissions monitoring. The South Coast Air Quality Monitoring District is trying to provide some degree of accuracy and standards for such instruments. EPA has a pilot program to try to determine what the data that is obtained actually means. Most weather reporting provides an air quality index that gives an indication of air quality for various ranges (good, moderate, unhealthy, etc.). EPA has developed a sensor scale for ozone (low, medium, high, and very high related to the 1 minute average of ozone readings).

Looking ahead, there will continue to be a proliferation of low cost sensors, citizen enforcement, and more public relations issues. One potential benefit of these sensors is the possibility for reduced costs for the more traditional monitoring systems. The Refinery MACT noted that there are 142 large refineries and 7 small refineries in the US. Some 20,000 ton/yr of HAP are emitted as fugitive emissions. The fence line monitoring program is intended to validate that adequate controls are in place and meeting emissions standards. A trigger level of 9 ug/m3 would require a plant to perform root cause analysis and then initiate corrective action. A corrective action plan must be developed and submitted.

The sorbent picks up organic compounds, but the requirement is for benzene. Sampling is taken every 2 weeks. A minimum number of sampling sites of 12 is required. Weather data is required. The concentration difference upwind and downwind is measured and a rolling average difference is calculated. The 9 microgram trigger corresponds to 2.8 ppb. This system is intended to be a "work practice standard".

Gary Merritt, InterPower /AhlCon Partners. L.P., reported on the coal combustions residuals (coal ash) and water rules. EPA has issued a report on CCRs that provides status on the 2016 WIIN Act. States may develop and submit a CCR permit for EPA approval. The statute directs EPA to approve and State program that requires each CCR unit to achieve compliance with appropriate regulations. RCRA subtitle D does not treat CCRs as a waste. State programs must be at least as protective as subtitle D. The rule does not apply to industrials. However, a state program could include industrials. Since EPA can approve the state program, it is possible that industrials could be pulled in.

On the WOTUS rule, comments are due by Sept. 27th. The new proposal goes back to the rule prior to the proposed 2015 rule that has been stayed. A second step will be to redefine the application to be in line with Justice Scalia's interpretation of "navigable waters". A coal ash law suit against TVA has prompted EPA to look at applications other than coal ash. In PA, there are plants with NPDES permits that were applied for in a timely basis, but have not received comments or approvals from the state. The Sierra Club has filed suit against the state for not providing timely review of permit applications. In one case, the permit application is 16 years old. The Sierra Club is saying that the plant is not in compliance with more recent rules and should be denied the permit. Since the air rules are pretty much in place and in compliance, the eNGOs are going after coal plants on the water side.

John Burnett, HDR, reported on the 316(b) rule. The rule impacts water intake structures, including impingement and entrainment of various species. Impingement applies to fish or organisms that cannot pass through an intake screen. Entrainment pulls in the smaller organisms that go through the screen and are entrained in the flow. Facilities between 2 and 125 million gal/day have lessor requirements. Larger flow facilities require entrainment studies (2 years), peer review, services review, and best technology requirements. Social benefits need to be considered.

There are regional differences. New York and New England tend to be very strict with active intervenors. The Southwest has relatively few facilities. California has few facilities, but stringent regulators. The Pacific Northwest has a lot of hydro facilities. As a result, regulators are not too familiar with 316(b) rules. The rule applies to the NPDES permit approval. The peer review issue is critical. It is important to get that started early in the planning process so that a problem doesn't come up right before the deadline.

There are some law suits underway. A full or partial remand could result. A full remand will push the authority back to the states. A partial remand will impact only the section that has been remanded. For the lower flow facilities, it is important to identify compliance strategies that are already in place (cooling towers, low screen velocity, reduced flow, etc.). Develop a record of "no impact". For the larger facilities a strategic plan would be required. Put a good team together. Engage the state early. Anticipate a continuous improvement type process. Risk management dictates that potential impacts be identified early. Litigation should be anticipated for large or contentious facilities.

Mick Durham, Grain Processing Corporation, reported on 316(b) activity for their plant on the Mississippi River. Information requirements that are applicable for the facility have to be submitted. The due date is in 2021. A technical feasibility and cost report is also required. A progress report is required every year. Closed cycle recirculating systems must be evaluated. Alternative technologies must be evaluated. Costs for these systems must be included.

Scott Darling, Alcoa Corp, provided an update on the Midwest Ozone Group (MOG) activities. The Kentucky "Good Neighbor" SIP was rejected by EPA. EPA has asked MOG to work with Kentucky to help provide good information for their SIP plan.

Ann McIver, Citizens Thermal, noted that some industrial units were involved in the NOx SIP call. Since industrial units are not subject to CSAPR, they really shouldn't be targeted by the rule. EPA still wanted the units to have CEMs and possibly controls. North Carolina has submitted a SIP without the industrial units. CIBO will comment that industrial units should not be required to have Part 75 CEMs.

Amy Marshall, AECOM, reported on the Risk and Technology Review (RTR) program requirements. The RTR is a combined effort to evaluate both risks and technology as required by the MACT rules. Section 112 has 2 sections to address HAP emissions. Part 112(d) requires technology standards for the MACT. Part 112(f) requires a one-time residual risk review to evaluate residual risk and the potential impact on human health. EPA has finalized RTRs for 56 source categories. There are 62 more source categories to be completed, 47 of which are under court orders. The schedule goes out to June 2020. EPA cannot miss court ordered deadlines.

On the technology side, every 8 years EPA is to review the state of technology to see if either new technologies or improved technologies might qualify as MACT. Work practice standards and process changes are also considered. Significant cost changes are also reviewed.

For risk review, EPA must determine if there is acceptable risk from the source category. If risks are unacceptable, EPA cannot consider cost in identifying emissions standards necessary to brink risks to an acceptable level. EPA can consider cost for the "ample margin of safety". While the RTR is being performed, EPA is making technical corrections, considering additional processes and HAP, removing SSM, adding 5 year repeat testing, reviewing venting provisions, and adding electronic reporting. The use of surrogates is also being reviewed. As these reviews are carried out, there is the potential for more stringent controls or new sources/standards.

For the Portland Cement MACT, which was signed Sept. 1, the risks were determined to be acceptable and no changes were required by the technology review. The gas turbine RTR is in progress. In the process, EPA has prohibited releases from pressure relief devices. A new area source rule was promulgated for wool fiberglass furnaces. Mercury from phosphate rock calciners

will be regulated. In ferroalloys, dust monitors will be required for fugitive emissions. The fence line monitoring for refineries will likely set a precedent for the chemical industry. Due to the compressed schedule resulting from the court orders, the Industrial Boiler MACT will likely be put off for a while.

Monica Vale and Michael Shim of Higher Logic provided a community demo for setting up a profile on the CIBO Community Site. The log in and community posting procedures were demonstrated live.

Lisa Jaeger, Bracewell LLP, provided the litigation review. The MATS cases are in abeyance. The Boiler MACT reconsideration case is going to oral argument this week. The cert for malfunctions was denied. The 130 ppm standard for CO is being challenged both for using CO as a surrogate and the calculation of the standard. Work practice standards for startup and shutdown are being challenged. Future issues include use of GACT rather than MACT, synthetic minors Title V exemption, UPL, CO as a surrogate, and some category issues.

The Stationary Combustion Turbine MACT RTR is now due in 2020. There are 9 law suits challenging RTRs. Many cases had been put in abeyance. The 2008 decision rejected environmental claims that the floor had to be changed upon review. This was reaffirmed in the 2013 case. This was stated again in a 2015 case. However, the judge in the last case put a foot note that stated that EPA could interpret the need for a change in the floor. The foot note could leave the door open for the environmental claim to be brought up again. The RTR looks at both technology and risk. It is important to get the agency to specify which of these is being used to support any change in standards. The PA 3 year extension for covering coal ash reclamation was challenged in a letter from EPA to review the conditions.

The Clean Power Plan was pulled back. Law suits were put in abeyance pending a new proposal. The 2008 ozone NAAQS case will go to oral argument on the 14th. The 2015 ozone standard was proposed for delay by the US House of Representatives. There is a new briefing schedule for the CSAPR update rule. The refrigerant management rule was challenged as an ozone depletion substance rule was used to regulate a substance that was not an ozone depleting substance, but rather a GHG. The court upheld the complaint. EPA has proposed to hold this in abeyance. EPA proposed a change in the consistency rule. This was challenged by industry. Oral argument has not been scheduled. The risk management plan rule has been pulled for reconsideration. The law case in in abeyance. The effective date of the rule was moved to February 2019. This was challenged by Air Alliance Houston. The 316(b) is in oral argument today.

The EGU effluent limitation guidelines was again petitioned for reconsideration. EPA granted reconsideration and must now tell the court which issues will be severed and which might be changed. The Supreme Court has agreed to hear the WOTUS rule case. This is a jurisdiction issue as to which court gets the case. The Clean Water Act allows petitions to go to district court. The Clean Air Act sends all cases to the 6th Circuit Court. Oral Argument is scheduled of October 11th. In the meantime, EPA has pulled back the rule for review.

On the Non Hazardous Waste Materials rule, the other treated railroad ties have petitioned for fuel classification. In a hazardous materials waste case, the court threw out "factor 4" of the legitimacy criteria, which was comparable contaminants. This was remanded to EPA. Factor 3 (valuable commodity) was upheld. The court said EPA failed to respond to a 1987 decision that held reclamation equals discard rule was overboard. This may have impact on sewage sludge incinerators (112 vs 129). There has also been some litigation on rules that have been delayed under

the Administrative Procedures Act. One (oil and gas methane) has been decided and the rule went back into effect. Three others are pending.