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Member Value through Programming

by Michael Miller
president@awma.org

In searching for a topic that readers would find of interest for this month’s message, I drew upon the works of two recent Past Presidents—Merlyn Hough and Sara Head—for my inspiration. I decided to focus on programming—a keystone of our Association.

By programming, I mean the webinars, workshops, conferences, courses, and other means the Association employs to bring to its members and environmental professionals the best and most up-to-date information on topics of interest. In particular, I have been very impressed with the number and variety of webinars that we have been able to host this year. Carol Clinton of the Education Council deserves much of the credit for being so aggressive in pulling these together and finding top-notch speakers. Attendance has been extraordinary, especially for the new source review series, hosted by Gary McCutchen, and the oil and gas series.

My inspiration from reading the Past Presidents’ messages was the reminder about the rich history and tradition of this Association and how we have evolved to remain relevant in an ever-changing landscape. I believe this is in large measure due to the neutral forum we were looking for, excellent programs not only provide value to members, but also much-needed cash flow for the Association. As I write this message, I am about to leave for the joint EPA-EPRI-DOE-A&WMA MEGA Symposium in Baltimore. This symposium allows me the opportunity to wear two hats: President of A&WMA and employee of EPRI. In fact, it was at my suggestion several years ago that EPRI came to the Association to ask if they would be willing to host the MEGA Symposium. A&WMA provided the neutral forum we were looking for, excellent conference organizing skills, and an Association membership that was an excellent complement to EPRI’s membership. A win-win.

I encourage each of you to consider ideas for programs that you feel would be a valuable contribution to our members and the environmental profession at large. While we are primarily an Association of air and waste professionals, many of us have other responsibilities, so as far as I am concerned, any environmental topic is fair game. I encourage each A&WMA member to consider hosting a webinar that you feel would have broad appeal to our audience. Perhaps something you have done locally might have national or international interest? If you have an idea you would like to share with us, please contact President-Elect Dallas Baker (Dallas_Baker@deq.state.ms.us), Chair of the Program Development Task Force.

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by John Bachmann

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Existing Salem Harbor coal-fired generating station and (inset) artist’s rendering of the rebuild conversion to a new LEED-certified gas-fired combined-cycle generating plant (see article on page 27).

Photo © 2014 Marilyn Humphries

Rendering © COOKFOX Architects

Natural Gas Power and Climate
The transition of power from coal to natural gas is being driven by environmental concerns, economics, and regulation

Coming to the U.S. Environmental Protection Agency’s (EPA) air office in the midst of the energy crisis in the early 1970s, one of my first projects involved the “Clean Fuels Policy,” which was prompted by new energy and Clean Air Act legislation. That legislation required that the federal Energy Administrator prohibit any power plant from burning natural gas or oil, if the conversion to coal was feasible and environmental standards were maintained. Concerned by the lack of progress, as well as continued gas shortages, Congress passed new legislation superseding this law that banned the use of natural gas for new power plants and encouraged curtailment of its use in existing plants after 1990.

The causes of the twin energy crisis of that era were complex, but it is the case that U.S. production of both oil and natural gas peaked in the early 1970s. While the oil embargo of 1973 triggered the crisis in global oil and gasoline supply, the contemporaneous shortages of natural gas in the United States are generally regarded as caused by federal price controls. Indeed, U.S. natural gas production continued to decline until the late 1980s, following a two-step process deregulating wellhead gas prices in 1985 and 1989. Trends in natural gas use for electrical generation were similar, falling from a peak in 1971 to lows in the late 1980s. The 1990 U.S. Clean Air Act contributed to an increasing use in the power sector that by the late 1990s had passed the 1971 peak.

Without price controls, production expanded until the turn of the century, with the even faster increase in demand met by Canadian imports. But production declined between 2001 and 2005 and prices soared. A 2003 article in Time decried the “first big energy squeeze since the 1970s” in an article titled, “Why U.S. Is Running Out of Gas.”

Federal Reserve Chairman Alan Greenspan told Congress that he saw the likelihood of increased imports of liquefied natural gas. At that time, no one forecast the dramatic increase in natural gas production from deep shale formations that by 2011 had already passed the former U.S. production peak of 1972.

The increasing supply of shale gas made possible by hydraulic fracturing has already resulted in
benefits for the economy, energy security, and the environment. In the power sector, lower prices have increasingly prompted switching from coal to gas in order to meet more stringent targets for emissions of sulfur, nitrogen oxides, and mercury. Yet questions remain as to how long this boom can continue to supply increasing demand for power generation, the public’s concern about local impacts of increased production, as well as the implications of current and future air pollution and greenhouse gas regulations on production and end use.

The July 2014 issue of *EM* discussed broad questions for a sustainable energy future, as well as the debate over potential local environmental impacts. This issue focuses on additional issues related to the power sector, climate, and permitting. In the first article, Martin and Hodge of the U.S. Energy Information Administration (EIA) present EIA’s most current assessment of recent and future dispatch of natural gas- and coal-fired power plants through 2040. EIA’s reference forecast includes the most recent applicable regulations from EPA, nine eastern states, and California. It does not include the potential effects of EPA’s proposal to reduce carbon pollution from the existing power sector by 30% in 2030. Switching some plants from coal to gas is a major “building block” in EPA’s proposed guidance to states. However, the EIA work does include three alternate scenarios, one of which includes a hypothetical carbon tax that achieves carbon dioxide reductions similar to EPA forecasts for its rule.

Also in this issue, Drew Nelson of the Environmental Defense Fund outlines the environmental risks that accompany the continued expansion of natural gas production and consumption, as well as the potential for further regulations of this sector. Nelson focuses on climate concerns raised by emerging evidence of higher than expected methane emissions. These increases come not just from production, but the entire system, which also includes processing, transmission, storage, and distribution.

Some have argued that this system leakage is high enough that switches to methane as a “bridge” fuel for power generation would have little or no benefits to climate.7 While more results on leakage rates are expected in the near future, most recent analyses suggest they are not high enough to negate the substantial greenhouse gas reductions that accompany switching from coal to gas.6 Moreover, EPA’s impact analysis5 for the proposed power sector carbon rule suggests that the guidelines actually might reduce net methane emissions. The agency projects the increases from natural gas production would be more than offset by methane decreases from reduced coal mine methane emissions. Of course, such analyses must be revisited in light of the most recent emission factors.

In our third article, Wehland and Hayes take a look at a definitional issue relevant to permitting for hydraulic fracturing activities. They examine the regulatory and legal reviews surrounding EPA’s policy regarding aggregation of industrial activities into a single source to determine if it is large enough to require Title V or PSD permitting.

And in our last article, Golumb, Zemba, and Arak document a specific example of an indirect fuel switch—the construction of a new gas-fired combined-cycle generating plant on the site of a former coal-fired station, the Salem Harbor Generating Station.

Finally, I want to thank Gary Bramble of Dayton Power and Light for his help in championing this issue.

References
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In the United States, based on relative economics, coal-fired power plants have generally been dispatched ahead of natural gas-fired plants to generate electricity, although regional variations in fuel prices and variable operating costs can lead to exceptions. Since 2009, natural gas combined-cycle plants, in particular, have come into dispatch-level competition with existing coal plants due to declining natural gas prices.

Record low natural gas prices in 2012 resulted in coal’s share of total U.S. electricity generation dropping to 37%, compared with 50% in 2005, while natural gas’s share grew from 19% in 2005.
to 30% in 2012. Total carbon dioxide (CO₂) emissions in the power sector fell 16% in this same period, while demand for electricity was fairly flat. This decline was due largely to the decrease in the level of coal-fired plant operation in favor of increased generation from natural gas-fired combined-cycle plants, which emit about 40% of the CO₂ of a coal plant per megawatt hour (MWh). Coal has regained some market share since 2012 as natural gas prices have increased, but in the long term, coal generation is not expected to reach historical levels as coal plant retirements occur and few new coal plants are expected to be built.

The U.S. Energy Information Administration (EIA) publishes projections for the energy sector in its Short-Term Energy Outlook¹ (STEO) and Annual Energy Outlook 2014² (AEO2014) reports. The STEO produces monthly projections over a 13–24 month forecast horizon, and reflects the seasonality in the use of different generation fuels, regional differences in generation patterns, and the responsiveness of power generators to changes in relative fuel costs. It does not explicitly model environmental regulations, but does reflect recent trends in generation patterns that may be driven in part by the industry’s reaction to expected shifts in policy. The AEO2014 contains annual projections through 2040 and includes assumptions regarding current laws and regulations, including environmental rules such as the Clean Air Interstate Rule³ (CAIR) and the Mercury and Air Toxics Standards⁴ (MATS).

The June 2014 edition of the STEO forecasts that the total level of U.S. generation this year will be 1.9% higher than in 2013, primarily because colder winter temperatures in the early part of the year led to higher electricity demand. However, the use of natural gas for electricity generation is projected to decline in 2014 due to rising natural gas prices. While the AEO2014 also projects a near-term dip in natural gas generation, in the longer-term almost three quarters of new capacity added through 2040 will be natural gas-fired, and total natural gas generation surpasses coal generation by 2035. Power sector CO₂ emissions are projected to grow by 11% between 2012 and 2040 in the AEO2014, slower than the 25% increase in total electric power generation, indicating a shift
to less carbon-intensive generating resources or improved efficiency. Uncertainty surrounding future natural gas prices and potential greenhouse gas (GHG) legislation and regulation will influence these projections.

**Background**

Generally, operators dispatch power plants based on their variable costs of generation, of which a key input is the cost of fuel. Figures 1–3 show dispatch supply curves for the Southeastern states representing the summer months of 2010, 2011, and 2012, respectively. The dispatch curves are formed by ranking all plants by their variable operating costs (as measured in dollars per MWh) and accumulating the plants’ summer generation. Plants at the lower end of the dispatch curve run more frequently, since they are more economical to operate. When comparing across the three figures, the curves show some natural gas-fired generating plants moving down and to the left on the curve, shifting ahead of some coal-fired plants as a result of changing relative fuel prices, particularly in 2012. Although not included in the figures, in 2013, the average delivered price of natural gas rose 27% above 2012 levels, causing the dispatch order to shift back to favor coal-fired plants. As a result, coal generation rose 5% while natural gas generation fell 9% in 2013. However, in the long term, impending environmental legislation and uncertainty surrounding the longer term fuel prices will affect the future market share for coal generation.

**Short-Term Outlook**

Despite an expected increase in total generation in 2014, EIA’s June 2014 STEO projects a continued decline in the use of natural gas-fired power plants as the forecast average U.S. cost of natural gas grows at a much higher pace (28.6%) than the forecast cost of coal (0.7%) (see Figure 4). Operators are substituting coal for natural gas this year to supply the increase in total generation and to offset a slight decline in nuclear-powered generation resulting from the recent retirement of a few nuclear units. This substitution between fuels translates to changes in each fuel’s relative share of total generation. The June 2014 STEO projects the U.S. share of generation fueled by coal will average 40.5% this year, up from 39.1%
in 2013. This projected share for 2014 is still lower than coal’s 42.3% share of generation in 2011. In contrast, the share of U.S. generation fueled by natural gas in 2014 averages 26.5%, down from 27.4% last year.

In 2015, EIA expects an increased supply of natural gas, which should lower the cost of the fuel for power generators. Figure 4 shows the average per MWh fuel cost of operating natural gas combined-cycle plants and coal-fired steam turbines, based on the average efficiencies of the current fleet. During 2015, the STEO projects that natural gas prices will fall 7.1%, while the cost of coal stays relatively steady. In addition to fuel prices favoring natural gas generation, the retirement of some coal capacity in recent years leads to other fuels such as natural gas needing to meet the generation formerly supplied by coal.

**Long-Term Outlook**

EIA’s AEO2014 Reference case presents projections for the U.S. energy sector through 2040, assuming current laws and regulations. In the electric power sector, the environmental regulations modeled include CAIR; MATS; the Regional Greenhouse Gas Initiative (RGGI), which sets a cap on power sector CO₂ emissions across nine Northeastern and Mid-Atlantic states; and California’s Assembly Bill 32 (AB32), which restricts carbon emissions in the state across several sectors, including electric power.

In the AEO2014, to comply with MATS, it is assumed that all qualifying coal-fired power plants must be equipped with either flue gas desulfurization (FGD) scrubbers or dry sorbent injection (DSI) systems and activated carbon injection, if warranted, for mercury control by 2016, or else the plant must be retired. In the AEO2014 Reference case, 46 gigawatts (GW) of existing coal plants are projected to retire by 2016, while 30 GW will add FGD controls and 45 GW will add DSI systems. This equipment also reduces emissions of sulfur dioxide (SO₂); by 2016 SO₂ emissions are projected to be below the cap specified by CAIR. Between 2012 and 2016, total power sector nitrogen oxides (NOₓ) emissions fall 14% and SO₂ emissions decline by 61%.

In April, the U.S. Supreme Court overturned the lower Court’s decision to vacate the Cross-State Air Pollution Rule (CSAPR) that was to replace CAIR, although currently CAIR remains in place. CSAPR also addresses reductions of SO₂ and NOₓ through multiple cap-and-trade programs covering specific states. However, it is expected that the retirements and retrofits implemented for

---

**Figure 4. Average U.S. delivered fuel costs and electricity generation by fuel.**

*Notes: Labels show percentage share of total generation provided by coal and natural gas. Source: Short-Term Energy Outlook, EIA, June 2014.*
EIA’s *Annual Energy Outlook 2014* predicts that natural gas generation grows by 50% between 2012 and 2040 and surpasses coal as the largest source of U.S. electricity generation by 2035.

**Figure 5. Ratio of average per MWh hour fuel costs for natural gas combined-cycle plants to coal-fired steam turbines in four cases, 2005–2040.**

**Notes:** The GHG10 case assumes a $10 per metric ton fee on CO₂ emissions, beginning in the year 2015, and escalates the CO₂ fee at a rate of 5% per year. Source: *Annual Energy Outlook 2014*, EIA, May 2014.

MATS would also result in SO₂ emissions below the CSAPR limits.

In the AEO2014 Reference case, once the 2016 coal plant retirement decisions are made, the remaining coal plants are projected to increase output over several years as capacity factors reach relatively high levels and then maintain a consistent output throughout 2040. Competition with existing natural gas plants along the dispatch curve is limited, as natural gas prices are projected to rise through 2040. However, little new coal capacity is projected to be added through 2040, while significant amounts of new natural gas-fired capacity is built to replace retired units and meet demand growth. As a result, natural gas generation grows by 50% between 2012 and 2040, and surpasses coal as the largest source of U.S. electricity generation by 2035.

The AEO2014 does not directly model any federal GHG legislation or regulation, including the recent U.S Environmental Protection Agency proposals on standards for either new or existing sources, because there still is no final rule promulgated. However, to examine the impacts of uncertainty surrounding future legislation, as well as surrounding future costs, resource availability or commodity prices, the AEO2014 includes a number of side cases. While several cases are highlighted here, the full report includes many additional cases, such as alternate electricity demand and plant retirement assumptions, which also impact the fuels used for power generation and the resulting emissions.

Three cases are discussed in this article relative to the AEO2014 Reference case:

- **The Low Oil and Gas Resource Case** assumes less supply for oil and natural gas through lower estimated ultimate recovery per well, resulting in higher costs to develop these resources. Delivered natural gas prices to the electric power sector are 33% higher in 2040 than in the Reference case.

- **The High Oil and Gas Resource Case** assumes greater supply for oil and natural gas through higher estimated ultimate recovery per well and increased development. Delivered natural gas prices to the electric power sector are 37% below the Reference case in 2040.

- **The GHG10 Case** imposes a fee on energy-related CO₂ emissions to represent policies that explicitly or implicitly place a value on GHG emissions. The GHG10 case assumes an initial CO₂ value of $10 per metric ton in 2015, rising by 5% per year through 2040. This fee is applied economy-wide, to all energy sectors, and is passed through the delivered fuel prices based on the average carbon content of the fuel.

As seen in recent history, the opportunities for competition between existing coal and natural gas generation depend primarily on the relative fuel prices. Because natural gas combined-cycle plants are more efficient to operate than the average coal plant, the natural gas delivered prices generally need to be within 35–40% more than coal delivered prices for the average fuel cost per unit of generation to be competitive. Figure 5 shows the ratio of average per MWh fuel costs for natural gas combined-cycle plants and coal plants, across the Reference case and three side cases. It illustrates the relative competitiveness of the two plant types, taking into account the differences in efficiencies.

In 2012, when delivered natural gas prices averaged $3.42 per million British thermal unit (MMBtu) and delivered coal prices average $2.38 per MMBtu, the resulting fuel costs per MWh of coal and natural gas combined-cycle plants were almost equal, reflecting the greater efficiency of the combined-cycle technology. In the High Oil and Gas Resource case, the lower natural gas...
prices result in the ratio moving closer to 1.0, where the fuel prices are identical on a dollar-per-MWh basis and there are more opportunities for natural gas plants to displace coal. Similarly, in the GHG10 case, because the carbon fee is applied through the fuel prices and the coal price will see a larger impact based on its higher carbon content, the ratio again moves closer to 1.0.

Conversely, if natural gas prices were higher, as in the Low Oil and Gas Resource case, the coal plants remain cheaper to operate throughout the forecast, based solely on fuel costs. However, this relationship primarily reflects the competition for dispatch of existing units and not the relative cost effectiveness of new capacity expansion. Because of higher construction costs and uncertainty surrounding GHG standards, new natural gas-fired plants are generally more economical than new coal plants regardless of the natural gas prices in the scenarios examined in the AEO2014. If natural gas prices are higher, other non-fossil technologies may then be more economical than both coal and natural gas-fired plants.

Electricity Generation by Fuel
The projected levels of coal and natural gas generation are impacted in these alternate cases.

Figure 6 shows electricity generation by fuel in 2012, 2025, and 2040, across four cases. In general, any shift in coal generation occurs early in the projection, when MATS becomes effective, and coal generation tends to remain steady after that point. The exception is when a carbon price is added, where the increasing carbon fee throughout the forecast period results in additional retirements after the 2016 MATS compliance date. By 2040, the coal share has dropped in all cases, and ranges between 19% in the GHG10 case and 35% in the Low Oil and Gas Resource case.

Natural gas generation varies significantly across the cases, particularly by 2040, where the natural gas generation ranges from 1,231 billion kilowatthours (24% share) in the Low Oil and Gas Resource case to 2,399 billion kilowatthours (44% share) in the High Oil and Gas Resource case. In the High Oil and Gas Resource case, natural gas generation surpasses coal generation before 2025, more than 10 years earlier than in the Reference case. In the GHG10 case, by 2040 total generation from natural gas-fired plants is slightly below the Reference case, while increases in generation are seen from new nuclear and renewable capacity additions. Under an increasing carbon fee, eventually natural gas-fired plants
become less economic to build and operate than the more capital intensive but carbon-free generating options.

**CO₂ Emissions across Cases**

Carbon dioxide emissions in the power sector are affected by the relative levels of coal- and natural gas-fired generation, as well as changes in the overall generation levels of nuclear and renewable generators. In Figure 7, CO₂ emissions in the power sector increase relative to 2012 levels in all cases shown except the GHG10 case. In the High Oil and Gas Resource case, CO₂ emissions are initially lower than the Reference case, as natural gas generation displaces coal generation, but in the long term, the greater growth in natural gas generation results in total CO₂ emissions that are very similar to the Reference case.

Total power sector electricity generation is higher in the High Oil and Gas Resource case as the lower gas prices lead to lower electricity prices and greater demand growth. The average carbon intensity in tons per kilowatthour is about 5% below the Reference case value in 2040. With the higher projected natural gas prices in the Low Oil and Gas Resource case, total CO₂ emissions in 2040 are below the level of CO₂ emissions in Reference case—in this case, the decreased natural gas generation is not replaced by the more carbon intensive coal units, because existing units were already operating at high levels and new builds are primarily nuclear and renewable plants. In the GHG10 case, the CO₂ emissions drop significantly in 2016, when 65 GW of coal plants are retired, and continue declining throughout the forecast, due to the increasing price placed on CO₂ emissions. By 2040, CO₂ emissions are 29% below 2012 levels, and the average carbon intensity in the power sector is 34% below the Reference case.

**Conclusion**

In EIA’s AEO2014 Reference case, existing coal plants remain a large source of future generation, but the market share for coal generation will decline as most of the generation produced to meet incremental demand growth comes from natural gas. Further federal and state action to address GHG emissions in the United States could greatly alter the outlook for coal generation and the resulting mix of fuels used for electricity generation. If natural gas prices are higher than projected in the Reference case or if an explicit price is placed on carbon emissions, then growth in natural gas generation could be lower. This article focused on the national trends; however, variations exist across the country in fuel prices, operating costs, and the available mix of capacity and resources, all of which could lead to differing results in some regions of the country.

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There is no denying the natural gas boom is lowering energy costs, creating jobs, supporting more domestic manufacturing, increasing our energy security, and even delivering some measurable environmental benefits. But, as with any heavy industrial activity, there are also significant risks associated with its development. Valid concerns about groundwater contamination, air quality, and seismic activity from hydraulic fracturing and shale development have risen to the forefront—causing significant public concern about the benefits of expanded natural gas development. In a 2013 poll, the Pew

Amid growing public discourse about the benefits of oil and gas development, a key environmental concern is leaked methane, a potent greenhouse gas. This article considers how strong regulations and policies can be implemented to help minimize negative impacts.
Research Center found that more Americans (49%) opposed the increased use of hydraulic fracturing than supported it (44%)—signaling to the oil and gas industry that much improvement is needed to more safely develop this natural resource.1

This resistance is evident in Colorado, New York, and even Texas. Communities in each of these states either have or are considering bans on hydraulic fracturing. Until industry and regulators can show that the proper protections for public health and the environment are in place, many Americans will continue to have concerns about the widespread and growing development of this resource. The good news is that for most of these issues, strong regulations and policies can be implemented to minimize the impacts. The challenge, however, will be to ensure that those regulations and policies are being implemented; this is particularly true for methane.

One of the key environmental concerns with shale development is leaked methane. Natural gas is mostly methane, a potent greenhouse gas (GHG). During the first 20 years methane is released, it is 84 times more powerful than carbon dioxide (CO2) at trapping heat in the atmosphere.2 While the 100-year global warming potential of methane (28) is traditionally used more often, it undervalues the impact of short-term forcings like methane. New research shows that these short-term forcings are driving “as much as one-third of the current total greenhouse forcing” we are experiencing today.3 Reducing methane emissions now will result in relatively immediate climate benefits because of methane’s strong potency in the near-term.3

Small Leaks/Big Impacts

The U.S. Environmental Protection Agency (EPA) estimates the oil and natural gas sector accounts for 37% of the nation’s total methane emissions, making it the largest industrial source of methane pollution.4 Based on these EPA estimates, the amount of methane leaking into the air is equivalent to the annual GHG emissions from 117 million cars or 146 coal-fired power plants.5 These leaks also hurt industry’s bottom line; almost $2 billion of lost revenue vanishes into thin air every year when methane escapes across the system ($1.7 billion derived by using June 2013 – June 2014 average henry hub price ($4.31/Mmbtu)). Leaks can occur both intentionally and unintentionally during routine operation of equipment and facilities that produce, distribute and deliver new gas supplies to consumers.

Until recently, we’ve lacked a precise picture of just how much methane is leaking and from where. Over the last 12 months many important studies have been published that reach a startlingly similar conclusion; the oil and gas industry is leaking more methane than expected.6-11 More research is expected to be published over the coming months.12 Taken together, all of this research will help us better understand the magnitude of the problem and opportunities for improvement. While estimates about the precise amount of leakage vary, we know that reducing these emissions now provides both economic and environmental benefits. Further, reducing methane emissions now not only improves the climate benefit of using natural gas as opposed to other fossil fuels, but if coupled with reductions in CO2, will minimize peak warming this century.3

But that is only if we take action. Thankfully, there are countless opportunities and technologies available to reduce these methane emissions. A recent report by independent energy consulting firm ICF International found that methane leaks from the oil and gas sector can be reduced by 40% over the next five years by using existing technologies that are on the market today.13 And, these solutions are cost-effective—with industry spending less than a penny for every $4–$5 earned.13 Low-cost reductions of this scale are monumentally important toward ensuring that the expansion of natural gas development will not result in a net loss for the climate.

There are both cost and social incentives for industry to voluntarily reduce its methane emissions and some companies are doing exactly that. These leading companies deserve a lot of credit for the efforts they are taking. However, not all companies are taking a leadership role and the industry remains highly fragmented with thousands of companies across the country. It is neither realistic nor practical to believe voluntary measures alone...
will be enough to reduce the GHG pollution that is contributing to global warming. That’s why sensible regulation at the local, state, and federal level is necessary to ensure we can reap the full climate benefit from developing this natural resource.

Recent studies, in fact, have shown us areas where current regulations are working. For example, a University of Texas study published last September found that EPA regulations were effective in reducing 99% of the methane emissions from well completions.14 However, these regulations just cover new natural gas wells, leaving a gap in the current regulatory approach. Extending the current green completion rules to cover existing wells and hybrid oil-and-gas producing wells will close that gap and help further reduce emissions.

Taking Action
Awareness is building that methane is an issue that needs to be addressed. In March, the White House announced an interagency strategy for reducing methane emissions across the country, including from oil and gas operations. As part of this strategy, EPA has issued five white papers for public comment pertaining to known methane emission reduction opportunities in the oil and gas sector. These papers have undergone expert review, and it is expected EPA will make a decision later this year about how to further regulate methane emissions for the oil and gas sector.

States, however, are not waiting for the federal government to act. In February, Colorado put in place the nation’s first and most ambitious rules to directly reduce methane and volatile organic compounds (VOCs) from oil and gas development.15 The rule’s impact is far-reaching and, in addition to its impact on climate, it will remove the equivalent amount of VOC pollution produced annually by every car and truck in the state. What’s equally as impressive is the collaborative activity that helped see this regulation through to fruition. Recognizing the growing public concern about the environmental and public health impacts of oil and gas-related emissions, industry actually helped make the case that reducing methane and VOCs could be done cost-effectively, with no loss in production.

In a 2013 poll, the Pew Research Center found that more Americans (49%) opposed the increased use of hydraulic fracturing than supported it (44%).
of jobs or productivity. Colorado’s largest oil and gas companies worked with the Environmental Defense Fund and the governor to develop mutually agreed upon rules that serve as a model for what others can do to minimize climate damage and health concerns from oil and gas activity.

Colorado isn’t the only state taking action. Stronger leak detection and repair programs in Wyoming and Ohio also signal to regulators that states are willing to make smart decisions to protect communities and climate from the negative impacts of oil and gas development. There is a growing realization of the methane emissions problem, as well as other air and water concerns, and that this is a problem that can and should be addressed. Doing so ensures our natural gas reserves can both advance our national energy and economic interests, while also delivering a climate advantage. What we must do now is continue to build on that momentum.

**Conclusion**

It’s crucial to keep in perspective that our efforts to reduce methane emissions should not come at the expense of reducing CO₂. Whereas methane is highly potent, CO₂ remains in the atmosphere for centuries. Any rational climate policy must be aimed at reducing both the rate and intensity of global warming; or in other words, reducing CO₂ and methane. The opportunity exists for regulators and industry to implement strong, practical, and cost-effective regulations to reduce methane emissions. Through work undertaken by EPA and in leading states like Colorado and Ohio, the foundation is being laid for these regulations, but more needs to be done. Reducing these leaks will have an enormous positive impact on the environment and industry’s bottom line, while also providing confidence to the American public that oil and gas development can be done in a way that minimizes impacts on public health and the environment. Additionally, more and more research is pointing toward the complementary nature of renewable energy and natural gas. Federal regulators must take heed, step up, and regulate methane emissions, if we intend to fully reap the benefits of natural gas development. A world with more energy efficiency and renewable energy—enabled, in part, by a natural gas industry that is responsibly controlling emissions—is a world that gets us much closer to achieving the emission reductions necessary to meet the global challenge of climate change.

**References**

Hydraulic Fracturing Air Emissions: Whether Permitting

What air permits are needed for hydraulic fracturing wells? And how many wells can the U.S. Environmental Protection Agency (EPA) combine into a single permit? This article reviews the current regulations concerning EPA’s ability to combine disparate operations into a single source to determine permit applicability.

Defining exactly what is a “source” is critical for determining which air permits are needed for a particular project. For example, a source that consists of a single hydraulic fracturing well is unlikely to have enough emissions to need a major source construction (PSD) permit that requires best available control technology (BACT). By contrast, if that well is part of a source consisting of several other wells and a gas processing facility, it potentially would trigger those requirements.
Similarly, the major source requirements could be triggered if a pipeline and all of the compressor stations along it were considered a single source.

The U.S. Clean Air Act does not define the term source, leaving the definition and interpretation of it to the U.S. Environmental Protection Agency (EPA). EPA has struggled for decades to define and apply the term in a way that will withstand judicial scrutiny. In 1979, the U.S. Court of Appeals for the D.C. Circuit rejected EPA’s attempt to expand the definition to cover any combination of a “building, structure, facility or installation.” The court found that this approach impermissibly expanded the statute. Instead, the court directed EPA to “provide for the aggregation, where appropriate, of industrial activities according to considerations such as proximity and ownership.”

In response, EPA amended its regulations to focus on whether the “source approximates the common sense notion of a plant.” To do this, the agency issued a three-factor test, allowing aggregation of emissions from activities from oil and natural gas units, only if the units:

1. Belong to the same industrial grouping as judged by Standard Industrial Classification (SIC) codes;
2. Are located on one or more contiguous or adjacent properties; and
3. Are under the control of the same person (or persons under common control).

Where a single activity does not meet the major source threshold for a PSD construction permit or a Title V operating permit, EPA uses this test to evaluate if separate activities should be aggregated to be a single stationary “source” that may meet the threshold.

EPA Guidance on ‘Contiguous or Adjacent’

To determine if activities are in the same industrial grouping, the EPA rules rely on SIC codes rather than a subjective evaluation of functional interdependence. Despite this rejection of the functional interdependence test to determine if facilities are in the same industrial grouping, EPA’s regional offices began to weave it into their own interpretation of the contiguous or adjacent prong of the test. Functional interdependence is a qualitative concept that evaluates how closely related two activities are. For example, a gas well depends on a processing plant to prepare gas for use, and a processing plant depends on gas wells for its feedstock.

Interpretive letters offering guidance on the contiguous or adjacent prong of the test asked questions on whether different facilities would have integrated operations, on the support relationship between facilities, or on the interdependence of the facilities. Additional interpretive letters underscored that physical distance and proximity are just one factor in evaluating the functional interdependence test that EPA read into the “contiguous or adjacent” prong of the “source” definition.

Source Definition for Oil and Gas Wells

The consequences of dispersed oil and gas units being aggregated and found to be a major source are significant. In particular, major sources that are newly constructed or undergo a significant modification are required to employ BACT, which is based on the maximum degree of control that can be achieved considering energy, environmental, and economic impact. This case-by-case determination can include add-ons to control pollution or even modification to the underlying production process. A major source determination also could impose a Title V operating permit requirement.

In January 2007, William Wehrum, Acting Administrator for EPA’s Office of Air and Radiation issued a memorandum (Wehrum Memo) clarifying how source determinations could be made for the oil

Defining exactly what is a ‘source’ is critical for determining which air permits are needed for a particular project.
and gas industry. The memo was a nonbinding policy statement that recommended a source determination methodology for the contiguous or adjacent prong based primarily on distance. It noted that some state permitting authorities had determined that oil and gas units located outside a quarter-mile radius of one another are not “adjacent.” The Wehrum Memo went on to say that these separate sites need not be considered “adjacent” if separated by more than a short distance, such as a highway width or a city block. Finally, the memo highlighted the special consideration of aggregation of emissions from the oil and gas industries under Section 112 of the Clean Air Act:

We defined the major source under Section 112, for purposes of these industries, in reference to individual surface sites … Unless unique factors (such as proximity or interdependence) indicate otherwise, permitting authorities can consider oil and gas exploration and production activity located on a single surface site to be an individual stationary source.

The Wehrum Memo provided a simple approach that was consistent on the surface with the original three-prong test set out in 1980, but EPA withdrew the memo in September 2009, replacing it with Gina McCarthy’s memo, Withdrawal of Source Determinations for Oil and Gas Industries (McCarthy Memo). The new memo reinstated the more complex interdependence analysis finding that all three criteria identified in the source definition should be examined closely to arrive at a reasoned decision.

The McCarthy Memo read the Wehrum Memo as focusing on the contiguous or adjacent prong to the detriment of the other two prongs: common control and industrial grouping. As a result, the McCarthy Memo directed regulators to both the preamble of the 1980 regulations rejecting the functional interdependence test and to two decades of interpretive decisions interjecting a functional interrelatedness test into the “common sense notion of a plant.”

Application to Fracking Wells that are Geographically Separated

EPA’s varying interpretations of the contiguous or adjacent prong of the source test spawned regulatory and judicial uncertainty until the interpretation became the sole issue in the Summit Petroleum Corp. vs. EPA case decided in 2012. The U.S. Court of Appeals for the Sixth Circuit vacated EPA’s determination that Summit Petroleum’s physically separate natural gas sweetening plant and numerous sour gas production wells were a single, major source for purposes of Title V. Summit’s natural gas sweetening plant was connected through subsurface pipelines to more than 100 production wells located over approximately 43 square miles. Summit’s natural gas sweetening plant itself did not meet the threshold to be considered a single, major source, which would require a Title V permit. EPA’s decision rested on its consideration of the interdependent nature of related facilities.

The Sixth Circuit held that EPA’s interpretation was unreasonable and contrary to the plain meaning of the term “adjacent.” The court stated that “adjacent” is unambiguous and relates only to the geographical relationship between separate activities, rather than to their “functional interrelatedness.” Criticizing EPA, the court stated that “[t]he EPA makes an impermissible and illogical stretch when it states that one must ask the purpose for which two activities exist in order to consider whether they are adjacent to one another.” In short, EPA’s longstanding history of “executive error” permitted no deference by the court, and the court remanded to EPA to determine whether aggregating Summit’s plant and wells would be proper based on the ordinary meaning of “adjacent.”

EPA Guidance Letter on the Summit Decision. On December 21, 2012, in response to the Summit decision, the director of EPA’s Office of Air Quality Planning and Standards issued a memorandum (Summit Directive) directing its regional offices to disregard the Summit decision outside of those states within the Sixth Circuit: Michigan, Ohio, Kentucky and Tennessee. Specifically, the memorandum states that “EPA does not intend to change its longstanding practice of considering interrelatedness in EPA permitting actions in other jurisdictions.”

that invalidated the Summit Directive. At issue was EPA’s “regional consistency” policy requiring national uniformity in applying its regulations. Specifically, the policy requires EPA to “assure fair and uniform application” of the Clean Air Act and to identify and correct inconsistencies. The D.C. Circuit found that EPA’s Summit Directive puts facilities outside of the Sixth Circuit at a competitive disadvantage because those facilities are more susceptible to aggregation and heightened regulations under Title V. Moreover, in issuing the Summit Directive, EPA created a standard that violated its own regulations by directing its regional offices to apply Title V inconsistently.

Notably, however, the D.C. Circuit did not hold that EPA must follow the Summit decision in every circuit indefinitely. Rather, the court lays out three options for EPA: (1) revise regulations to explicitly provide for a functional interrelatedness analysis; (2) appeal the Summit case to the U.S. Supreme Court; or (3) revise its uniformity policy to allow for regional variances created by judicial decisions or circuit splits.

In sum, until EPA takes action to revise its regulations, EPA must (1) follow the Sixth Circuit’s Summit decision prohibiting EPA from considering functional interrelatedness, and (2) apply Summit consistently across all circuits.

Applicable Standards for Wells and Processing Plants

Even after Summit and NEDA, midstream processing plants still warrant careful evaluation for major source permits because they could have enough units and emissions to trigger major source requirements, especially when there is co-located cogeneration. However, Summit and NEDA do make it difficult for EPA to apply major source permit requirements to any individual oil and gas well. In the absence of major source permit requirements, hydraulic fracturing operations need to consider the applicability of several specific control and disclosure requirements under federal and state law.

New Source Performance Standards (NSPS).

NSPS apply to new sources and to modified or
reconstructed sources that meet specific source criteria usually related to the type and size of operation. For example, there is a specific standard for gas wells that are hydraulically fractured after January 1, 2015. The standard is found in Subpart OOOO, and is often called “Quad O” as a result. It requires a reduced emission completion (REC), commonly referred to as a “green completion” for all wells except for wildcat wells and delineation wells for which the reservoir pressure is insufficient.16

EPA estimates that the green completion requirement will reduce volatile organic compound (VOC) emissions by 95% at each well by requiring operators to capture gas that previously escaped during the flowback period and make it available for use or sale. The same rule includes standards for certain types of other equipment that could be located at or near a well site, such as sweetening units, pneumatic controllers, storage vessels, equipment leaks, and glycol dehydrators.

There are several other NSPS standards that can apply to the oil and gas industry. Specific standards depend on what kinds of facilities exist at a particular site and, in many cases, whether the sources were constructed, modified, or reconstructed after the standard’s applicability date. For NSPS purposes, a modification occurs when there is an increase in a source’s maximum hourly emissions rate, and reconstruction occurs when the cost of a project exceeds 50% of the cost of a new source.

NSPS Subparts commonly applicable to oil and gas production include:

• small industrial-commercial-institutional steam generating units (Subpart Dc);
• volatile organic liquid storage vessels (Subpart Kb);
• equipment leaks of VOC from onshore natural gas processing plants (Subpart KKK);
• SO2 emissions from onshore natural gas processing (Subpart LLL);
• stationary compression ignition internal combustion engines (Subpart IIII); and
• stationary spark ignition internal combustion engines (Subpart JJJJ).17

The Air and Waste Management Association invites you to attend the Inter-Mountain Oil and Gas Environmental Conference on October 29, 2014 at the West Denver Marriott Hotel in Golden, CO.

This one-day conference will cover regional and broad scale topics on current oil and gas environmental issues in the Rocky Mountain states including air and water quality, fracting, flaring, production curtailment, and Indian land issues. The conference will feature a State Air Directors Panel with high level executives from Colorado, Wyoming, Utah, North Dakota, and New Mexico. The Federal Panel on environmental issues includes representatives from the National Park Service, Bureau of Land Management, U.S. Forest Service, and U.S. Fish and Wildlife Service.
National Emission Standards for Hazardous Air Pollutants (NESHAP). NESHAP also apply to specific source categories that can include oil and gas production operations. In some cases, NESHAP are limited to sources that exceed specified major source thresholds for hazardous air pollutant emissions. In other cases, NESHAP apply to all sources in a particular category even if they are so-called area sources that do not exceed the major source emission threshold.

NESHAP subparts that frequently apply to the oil and gas industry include:

- hazardous air pollutants from oil and natural gas production facilities (Subpart HH);
- natural gas transmission and storage facilities (Subpart HHH); and
- stationary reciprocating internal combustion engines (Subpart ZZZZ).18

Injection Well Standards. Injection wells using diesel are subject to Class II operating requirements set forth in 40 C.F.R. § 146.23(a). These requirements mandate that, at a minimum, injection pressure should be limited so that injection does not cause the propagation of new fractures in confining zones adjacent to underground sources of drinking water (USDWs). Provisions in 40 C.F.R. § 146.23(b) also require that owners or operators of Class II wells conduct a mechanical integrity test at least once every five years during the life of the well.19

Aggregation and Regulation of Emissions from Compressors and Pipelines

The analysis so far has focused on aggregation principles as they apply to upstream production facilities. Although the same rules apply to pipeline facilities, EPA has been more consistent in stating that compressors along a pipeline generally will not be aggregated into a single source. In the preamble to EPA’s regulations setting out the three-prong test for aggregation, EPA wrote that, “EPA has stated in the past and now confirms that it does not intend ‘source’ to encompass activities that would be many miles apart along a long-line operation … EPA would not treat all of the pumping stations along a multistate pipeline as one ‘source.’”20 EPA also indicated that a distance of 20 miles between two facilities connected along a rail line would not be treated as one “source” as the facilities would be “too far apart.”

Compressor stations may be viewed as part of the production process or the transmission and storage process. In practice, EPA’s determinations of whether compressor stations associated with production activities are a single source or should be aggregated with the production facilities have been inconsistent. Yet, in the 2010 Frederick Compressor Station Ruling, EPA implicitly accepted the state agency’s determination that proximity was a primary factor in determining whether two activities were one source, and that without a showing that the two activities rely exclusively upon one another, and one activity cannot operate without the other, the activities are not a single source.21

As previously discussed, NESHAP Subpart HH can apply to oil and natural gas production facilities even when they are not aggregated as part of a single source. These regulations apply to glycol dehydration units, storage vessels with the potential for flammable emissions, and the group of ancillary equipment and compressors intended to operate in hazardous air pollutant (HAP) service, which are located at natural gas processing plants. If maximum natural gas throughput is less than 18,400 cubic meters/day, they are exempt from regulation.

Additionally, 40 C.F.R. Part 63, Subpart HHH sets out NESHAP for oil and natural gas transmission and storage facilities. It applies to natural gas transmission and storage facilities that transport or store natural gas prior to entering the pipeline to a local distribution company or to a final end user, and that are major sources of HAP emissions. EPA has determined that compressor stations associated with transmission and storage are not to be aggregated with other activities as a single source. In explaining its decision to renew a Title V operating permit for the Hardin Compressor Station, EPA stated that a booster station along a natural gas transmission line is not subject to Subpart HH regulations, but only to Subpart HHH regulations.22

Aggregation in Time

The foregoing discussion focused primarily on EPA’s effort to define what equipment will be aggregated as part of a single source. The concept of aggregation also can have a temporal affect on the scope
of a particular project that has to be considered in determining whether it constitutes a major modification that needs a PSD permit. EPA’s objective is to prevent companies from splitting larger projects into several small phases to avoid PSD review.

In general terms, projects that occur within 18 months of each other or that are part of a single, coordinated planning process may be aggregated by EPA into a single project to determine PSD applicability. For oil and gas production, this concept can pose particular problems for fast growing processing facilities that are planned in phases with units added less than 18 months apart as the surrounding play develops. If the processing facilities have cogeneration because power from the utility grid is unavailable or too expensive, the issues with aggregation in time can be magnified.

**Conclusion**

After the court decisions in *Summit* and *NEDA*, the threat that PSD and Title V permits will be needed for hydraulic fracturing has largely dissipated, although certain midstream processing facilities may still need to consider these issues. However, there are still a variety of federal requirements that may apply to specific activities, including the requirement for green completion of gas wells that are hydraulically fractured after January 1, 2015. Finally, each state may have its own requirements that vary to some extent from federal requirements.

**More Information**

Lowering the Carbon Footprint of a Traditional Fossil-Fuel Power Generation Facility

Converging economic and environmental factors in the United States are shifting fossil-fuel power production toward natural gas use. The case study described herein illustrates the advantages and challenges of replacing an aging coal/oil-fired power plant with a modern, gas-fired facility.

The electric power industry was responsible for 32% of U.S. greenhouse gas emissions in 2012.¹ The U.S. Environmental Protection Agency (EPA) recently proposed limitations on carbon emissions for new and reconstructed fossil-fuel power plants,²,³ as well as emission guidelines for existing sources.⁴ The industry is thus under considerable pressure to reduce greenhouse gas emissions.

Amid this backdrop, but motivated more by economic factors, Footprint Power Salem Harbor Development (FPSH) is constructing a nominal 630-MW natural gas-fired, quick-start combined-cycle generating facility at the Salem Harbor Power Station site in Salem, MA, to replace a recently retired generating station. Under optimum conditions, the new facility will be capable of generating a total of 692 MW. Construction of the proposed Salem Harbor Redevelopment Project began in June 2014 and the facility is expected to commence commercial operations in June 2016. The 65-acre site had been used for power generation since 1951. The current...
facility, shut down in June 2014, comprised at closing three 150-MW coal-fired units and a 433-MW oil-fired unit.

**Business Basis/Economics**

Footprint Power was formed in 2009 by power industry executives to help asset owners identify the opportunities presented by the shuttered and challenged coal- and oil-fired facilities in their portfolios. New environmental rules and increasing regulatory pressures on aging units exempted from some regulations, together with fading economic advantages, are compelling owner-operators of older, oil- and coal-fired generating facilities to rethink their commitment to continued operations. Shuttering the plants without repowering eliminates jobs and tax base from already struggling communities and leaves owners with environmental challenges and potential liabilities without the funds to pay for resolving these issues.

This project reflects Footprint’s business plan—specifically, decommissioning and demolishing older fossil fuel plants, and constructing new gas-fired generation in areas where load is required, and where political and community acceptance is favorable. The approach works well in this location, since large-scale renewable sources have yet to become prevalent (and hence there is an immediate need for additional generating capacity). Current and foreseeable fuel pricing, combined with the costs of air pollution control equipment, favor gas-fired power generation over other fossil fuels. The addition of a quick-start combined-cycle generating facility is viewed as a good fit for the Massachusetts market because existing wind power is an intermittent resource. While a number of quick-start peaker facilities recently have been sited in New England, Footprint’s quick-start technology (based on market/industry surveying) will be more efficient/competitive (and hence viable) and will have fewer emissions than peaker units that presently fill the gap when wind is unavailable.

Another key feature at this particular site is that no significant new generation has been added in the Boston demand zone for nearly a decade. Over the course of this period, there have been a number of unit retirements, with still more planned and anticipated, and load in the Boston load zone is not expected to decrease. The station will be configured as two operating units, with each unit able to operate independently to respond to dispatch requirements.

Footprint’s project has the opportunity to reduce environmental impacts at the Salem Harbor site in a number of a meaningful ways.
Environmental Improvements

With the recent shut down of the oil- and coal-fired units, Footprint’s project has the opportunity to reduce environmental impacts at the site in a number of a meaningful ways. The retirement of the existing facility, followed by the construction and operation of a new, state-of-the-art gas fired power plant, will result in significant decreases in air emissions, not just from the site, but from reduced operation of more polluting and less efficient units in the ISO New England (ISO-NE) region. By 2020, regional emission reductions from aggregate ISO-NE units of ~11% are expected for mercury (Hg), nitrogen oxides (NOx), and sulfur dioxide (SO2). The associated carbon dioxide (CO2) reduction will be equivalent to taking 90,000 cars off the road annually.

While the existing (retired) facility made use of sea water to cool the steam condensers, the new project design includes the use of air-cooled condensers, completely eliminating the need for sea water withdrawal (and avoiding thermal discharge to Salem Harbor). Similarly, potable water purchased from the City of Salem will be reduced by nearly 50%, thanks to reduced make-up water requirements in the steam cycle.

The switch from coal and oil to natural gas will also eliminate the need for fuel storage. Much of the land currently occupied by the coal storage pile and bulk oil storage tanks will be freed for other uses, and the occasional episodes of fugitive coal dust releases will no longer occur.

Fuel Supply and Power Distribution

Natural gas will be delivered to the site via a new 16-inch pipeline owned and operated by Spectra Energy. In order to interconnect with the new Spectra pipeline and on-site meter station, Footprint will construct a piping system using welded steel piping designed to safely supply natural gas fuel to the gas turbines and auxiliary equipment.

The high pressure portion of the system (with a design rating of approximately 750 psig) will be installed underground, transitioning to above-ground connections for each of the gas turbine generator fuel control valves and pressure reducing stations for the heat recovery steam generator (HRSG) duct burners and an auxiliary steam boiler.

The final design is expected to require approximately 1,200 linear feet of underground 12-inch piping. As of this writing, the pressure, capacity and route of the new pipeline are still being developed by Spectra.

Power generated from the new facility will be distributed through the on-site National Grid switchyard, utilizing the existing 115 Kv bus connections, with distribution through overhead and underground transmission lines.

Significant Benefits

One of the most significant project challenges has been the development of a facility that fits better with modern-day waterfront uses. View shed analysis and architectural design elements will be
The proposed rebuild of the Salem Harbor Generating Station will benefit the local region and the nation by producing electricity more efficiently and more economically.

Incorporated into the facility to ensure harmony of the new facility with the community. The project will be constructed on an approximately 16-acre portion of the larger 65-acre site. A visual barrier, in the form of a landscaped berm ~35 ft. high, will occupy an additional 4 acres. The project includes public access to the majority of the property, which had previously been unavailable to the people of Salem. Walking paths, parkland, and new vistas of the ocean will provide much needed green space to the area.

With demolition of nearly all elements of the existing facility and construction of the smaller facility, the harbor side of the site can be devoted to other marine-related purposes; property no longer needed for power generation can be made available for redevelopment as a ferry or cruise ship terminal, commercial marina, and/or other appropriate uses; and the site-related views will be dramatically improved (see Figure 1).

The layout and appearance of the project buildings and structures are heavily based on the dominant architecture in this historical area (Federal Style). In addition, the administrative building will be built integral to the visual barrier and will be Leadership in Energy and Environmental Design (LEED)-certified. The larger structures will make use of cladding and louvers to mitigate the traditional box-like appearance of typical power stations. Building heights have been staged so that structures are lowest near the street.

Because of the significant economic and other benefits provided by the proposed generating facility and future redevelopment of the larger Salem Harbor site, the project enjoys strong support from city officials, state senators, state representatives, and local citizens. Public officials and the residents of Salem view continuation of electricity generation on the site as a means of maximizing tax revenues and supporting the local economy.

**Technology**

The project scope includes: two gas turbine generators, two steam turbine generators, two HRSGs with selective catalytic reduction (SCR) for NO\textsubscript{x} control, and oxidation catalyst for carbon monoxide (CO) control. An ammonia (NH\textsubscript{3}) injection grid housed within the HRSG will be used to reduce NO\textsubscript{x} to 2 parts per million (ppm). In all cases, best available control technology (BACT) for natural gas-fired turbine design will be employed.

The effectiveness and functionality of this equipment will be monitored at all times by continuous emissions monitoring systems (CEMS), which help to minimize corollary emissions such as NH\textsubscript{3} slip. Key elements of the emissions controls systems include: dry low-NO\textsubscript{x} combustion burners in the gas turbines; NO\textsubscript{x} reduction using SCR, CO and volatile organic compound (VOC) reduction using catalyst-based systems; and quick-start design concepts for reduction of startup and shutdown emissions.

In terms of performance, the design of the project calls for high-efficiency equipment operating in combined cycle for best-in-class efficiencies, with heat rates approaching 6,000 mmBtu/kW (lower heat value) throughout the wide range of environmental conditions expected at the new facility site. This facility will be capable of reduced startup times, which has the dual benefit of reducing emissions and improving overall fuel efficiency. Not only will the time to achieve the majority of the gas turbine electrical output be shortened (approximately 150 MW from each turbine [300 MW total] in 10 minutes), but the time required to achieve full load output in combined cycle mode will be significantly shortened relative to previous designs.

**Tangible Environmental Benefits**

The new Salem Harbor facility will reduce pollutant emissions for two principal reasons. First, coal and oil are being replaced by natural gas, which by its composition intrinsically lowers emissions of traditional pollutants, such as SO\textsubscript{2} and Hg, and also results in lower greenhouse gas emissions due to the lower carbon content (higher H:C ratio) of the fuel. Second, the thermal efficiency of the proposed combined-cycle facility (~58%) will be significantly greater than the traditional Rankine cycle in place at the existing facility (35%), and parasitic loads (for solid fuel processing equipment such as the coal pulverizers and environmental control equipment like the fly ash-collecting electrostatic precipitators) will also be reduced. Additional factors associated with modernization, such as NO\textsubscript{x}...
control measures integrated into the design of the plant (as opposed to the retrofit measures used at the existing plant), will also serve to decrease pollutant emissions. Also, although not required at this time, the facility will meet EPA’s recently proposed carbon emission standards for fossil-fuel power plants.2

Table 1 provides a summary of anticipated reductions in key pollutants. Values are expressed on the basis of emissions per MW/hr of net power generation. For the existing facility, emission rates (except for CO₂) represent applicable emission limits. Values for the proposed facility are based on the expected performance of the equipment, as provided to the MA Energy Facility Siting Board. These comparisons demonstrate that the proposed facility will emit at concentrations two orders of magnitude lower than the existing facility. When Salem Harbor operated with high annual capacity factors, it was not unusual to see annual production above 2,000,000 MW/hr. More recently, this had dropped to less than 250,000 MW/hr annually.

**Conclusion**

The proposed rebuild of the Salem Harbor Generating Station will benefit the local region and the nation by producing electricity more efficiently and more economically (based on current projections). The proposed reconstruction is viewed as “win-win” for the local community, which will retain jobs and receive a cleaner, less visible partner. Lower emissions of traditional pollutants such as SO₂ and NOₓ will help to abate regional smog and acid rain. The switch to natural gas as a “bridge” fuel will promote greenhouse gas mitigation as a national strategy for energy policy develops. All in all, the economically-motivated decision to rebuild the Salem Harbor Generating Station simultaneously provides environmental benefits consistent with present proposals to limit greenhouse gas emissions.

**Table 1. Anticipated emission rate reductions at Salem Harbor (lb/MWₑ-hr).**

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In the Next Issue...

**Volatile Organic Compound (VOC) Emissions Control**

Controlling a myriad of volatile organic compounds (VOCs) emissions can be complicated and challenging. Further complicating matters, ground-level ozone is formed when VOCs combine with oxides of nitrogen in the presence of sunlight and heat. The November issue will look at how some sources are addressing VOC emissions.

**Also look for...**
- Asian Connections
- EPA Research Highlights
- PM File

**References**

6. Salem Harbor Power Station by massmatt reproduced unchanged under CC BY 2.0 license (https://creativecommons.org/licenses/by/2.0/). https://www.flickr.com/photos/momentsnotice/9636507469/in/photolist-fFxBWv-6RG3ju-6RC1n8-6KQyjk-6KUEKS-6KUEYJ-6KQxyZ.
21st Century Energy Boom and Greater Risk Awareness Drive EH&S Software Initiatives

In an effort to better collect, manage, and use environment, health, and safety (EH&S) information, many companies in energy-related sectors are migrating to integrated EH&S software applications for the first time.

Shale oil and gas drilling and deep water drilling in the Gulf of Mexico will raise crude oil production in 2015 to the highest levels since 1972. Recent oil and gas activity and related growth in the chemicals, pipeline, and transportation industries have created a 21st century energy boom. Rapid growth and emerging technologies like horizontal drilling and hydraulic fracturing present opportunities, but they also present operational risks, some with EH&S and sustainability impacts.

The energy boom, added to increased risk awareness due to recent offshore and chemical plant disasters, drives companies to seek better ways to collect, manage, and use EH&S information. Many companies in energy-related sectors are using integrated EH&S software applications for the first time; others are replacing aging, internally-developed applications or older enterprise applications with up-to-date, more capable systems.

Lessons Learned in the Gulf of Mexico

We Don’t Know What We Don’t Know

According to the American Petroleum Institute (API), the drilling industry has improved safety since the April 2010 Macondo well blowout, with...
new and revised API standards, plus safety and environmental management systems (SEMS) regulations, in place. Still, the Chemical Safety Board remains concerned about how companies address major incidents.

Is the Gulf of Mexico safer today? Author and business journalist Loren Steffy says, “We don’t know what we don’t know.” In contrast to the North Sea, where drillers embrace a safety culture, drillers in the Gulf do not consistently collect “near miss” data or report hydrocarbon releases; often the data are lacking and inaccurate. Steffy calls for

- industry to find better ways to collect, evaluate, and allow access to data in order to allow stakeholders to spot trends, assess system effectiveness, and conduct benchmarking;
- added industry scrutiny and added transparency; and
- independent regulators that enable proactive risk assessment rather than deliver prescriptive regulations and impose fines and penalties.

A New Risk Management Approach

The traditional risk management approach causes inconsistent processes and data silos, making it difficult to see the big picture. This approach places responsibility in a central corporate function; the businesses and functions where much of risk resides either downplay their responsibility or address risks with ad hoc business processes and tools.

The new risk management approach is an integrated framework that views an organization’s risks holistically. The framework helps prioritize risks to align with company strategies and apply the appropriate resources. It provides transparency, enhances decision-making, and maximizes a company’s ability to meet its objectives.

This new approach creates a corporate culture that embeds risk management into employees’ daily activities and allows businesses and functions to share risk responsibility with the corporate function. This calls for input from a variety of experts, the use of a variety of tools, and function-appropriate training.

Brian Salerno, director of the U.S. Bureau of Safety and Environmental Enforcement (BSEE), which regulates offshore oil and gas activities, says that risk is central to safety culture. Regulators and industry must focus on technology, the human element, an understanding of risk and how to effectively manage it. Salerno believes that greater emphasis on risk methodologies can improve SEMS, accident reporting and investigation, near miss reporting, and the ability to view trends.

Risk and IT Drivers for Software Solutions

Being able to extract and escalate critical risk information is nearly impossible without a robust risk management framework supported by a strong technology infrastructure. Three risk drivers lead companies to software platforms: understanding the pervasiveness of risk, understanding that risk intelligence drives performance metrics, and leveraging and harnessing big data.

Understanding the pervasiveness of risk. The 21st century energy boom illustrates a competitive landscape with new exploration and production technologies, emerging regulations and as yet undiscovered risks. Companies are tempted to move quickly to capitalize on the next opportunity. They should identify (and catalog), assess, evaluate, control, and monitor risks to protect stakeholder interests. Information technology can support the entire process.

Risk intelligence drives performance metrics. More and more companies use risk metrics in contract negotiations and in executive compensation. They generate massive amounts of data and need the ability to quickly analyze it, put it into context and make intelligent business decisions to provide a competitive edge. This requires robust risk and IT frameworks.

Leveraging and harnessing big data. Today, senior management requires enterprise-wide visibility and the ability to use structured and unstructured data to better understand the potential impact of a range of risks. Big data and analytics tools help to consolidate data in a usable form, showing forward- and backward-looking trends.

At the same time, two information technology (IT) trends are driving companies to use newer, capable enterprise software platforms: consolidating and
Consolidating and replacing legacy systems. IT groups can no longer support multiple legacy systems, outdated platforms, spreadsheets, and one-off databases. Security and staffing limitations drive IT groups to consolidate and replace legacy systems with current technology that allows data roll-up and reporting and real-time trend analysis. IT prefers a single platform or a limited number of integrated applications.

Increased acceptance of hosted and on-demand software. Lean IT staffing, high-speed Internet connections, cheap data storage and the Cloud make hosted and on-demand software attractive. Many companies that once insisted on installing all software on premises are moving enterprise applications to the Cloud.

Capable EH&S Software Enables Risk Management

An enterprise-capable software platform supported by rich, embedded content and robust reporting and analytics—combined with mobile, social, Cloud, and big data technologies—enables companies to

- collaborate to identify, evaluate, and analyze risk to make decisions that impact people, the environment, and sustainability;
- manage the policies, procedures, and regulations that drive data collection;
- drive risk accountability throughout the enterprise;
- consolidate and integrate data, with audit trails and transparency;
- establish and track performance against key performance indicators (KPIs);
- access embedded rich content to support risk decisions;
- visualize data on dashboards and via interactive queries to easily spot trends;
- easily and quickly generate reports and forms;
- access data anytime, anywhere, in the office and in the field, on a variety of devices; and
- add new functionality and data for new facilities as the organization’s needs change.

A booming energy economy and growth in ancillary industries create a new interest in risk management. A holistic risk management framework make sense for several reasons. To manage risk, companies need visibility into trends across business lines and geographies. They need consistent, accurate and timely data to make decisions. A capable, integrated, enterprise IT platform enables companies to link standard business processes, data collection, analytical and reporting tools, while taking advantage of mobile, social, Cloud, and big data technologies. em

References
Professionals of all ages and skillsets utilize professional development courses throughout their careers. These courses offer the promise of soft skill development, new perspectives, and the opportunity to relive both the satisfaction and pain of college course-style learning. As a young professional, I greatly value the skills and insights offered by professional development courses. Looking back over the last 10 years, I’ve noticed how my needs have changed. As a fresh-faced graduate, everything was new. On-the-job mentoring and apprenticeship taught me how to translate the concepts from my engineering classes into real-world implementation. As I came to terms with the real world’s needs and demands, I realized that, in fact, I really didn’t know anything about the skills that were required. I discovered that communication, critical decision-making, and project management are at times much more important to a project’s success than anything I learned from a text book in graduate school.
Sorry students and recent graduates, the real working world is here and you are going to have to start over in the school of life! But don’t panic, I’m going to walk you through the two things I think you need to learn—and the sooner the better.

Really Understand the Objective of Your Project

As many professional development courses will tell you, a central part of project management is decision-making. But before you make any decisions on what course of action to take, step back and really review a project’s purpose. The most important part of a project is to understand and define the problem rather than focusing entirely on solutions.

Here’s a real-life example of this concept: a group of Stanford University engineering students were given a class project to research and design a low-cost infant incubator for the developing world. Hypothermia is a preventable cause of death of premature babies without access to modern health care facilities, since premature babies cannot adequately regulate their own body temperature. The traditional way of thinking would lead us to believe that mitigating third world infant mortality requires an engineer to make a cheaper incubator (a traditional model roughly costs $20,000). However, the Stanford students looked at the problem with the end user in mind and thought about ancillary issues like availability of power and accessibility in remote areas when defining the problem. Instead of framing the problem as “How do we design a cheaper incubator?” the students framed the question as “How do we create a baby-warming device that helps babies survive in remote villages?” This creative frame of reference has turned into a successful start up company and created a product called the Embrace Infant Warmer. It costs 1% of the cost of a traditional incubator and could potentially save the lives of millions of low birth weight children around the world.

When you work on a project in the future, I want you to practice evaluating the problem statement, rather than seeking out immediate solutions. I have

By improving my soft skill sets, I am a more effective professional, regardless of my age and experience.

Scholarships
A&WMA has scholarships available for air quality research, solid and hazardous waste research, waste management research and study, and air pollution control and waste minimization research; last year the Association headquarters awarded $33,000 in scholarships.

Thesis and Dissertation Awards
A&WMA acknowledges up to two exceptional Masters Thesis and up to two exceptional Doctoral Dissertations each year. Nominations shall be made by the student’s faculty advisors, who are members of A&WMA, only.

Best Student Platform Paper Award
The Platform Paper Award will acknowledge up to two exceptional technical papers at the M.S. and Ph.D. academic levels for papers submitted for presentation at the 2015 A&WMA Annual Conference & Exhibition on June 22-25, 2015 in Raleigh, NC.

Best Student Poster Award
The Student Poster Awards recognizes student posters to be the best amongst those considered in the undergraduate, masters, and doctoral categories. Student must present the poster during the 2015 A&WMA Annual Conference & Exhibition on June 22-25, 2015 in Raleigh, NC to be eligible for this competition.

Visit www.awma.org/resources/students for more information.
worked with many seasoned professionals who are ineffective project managers because they focus entirely on identifying solutions in their first project meeting. They act before fully understanding the problem and wonder why the project was not more successful. By understanding the problem, you can better define and execute the solution.

**Develop Critical Listening Skills**

I was fortunate enough to go to a negotiation class in spring 2013. Something that really resonated with me was the instructor’s emphasis on asking questions about your opponent’s position to better understand their needs. An overly simplified explanation of the process is to really think about what your opponent is concerned about and his or her required outcomes. Ask them at least 20 questions before you even start to negotiate about the terms of your agreement. This emphasizes how critical it is to really frame an issue, understand the concerns of all stakeholders, and listen to what they need.

I left that course with a full skill set and homework to practice negotiations in my daily life. I practiced my negotiation skills with trivial things at first (e.g., “I’ll go grocery shopping and make dinner, if you to do the dishes.” My husband is not a fan of this class). To my surprise, I got to test out my newly developed skills later that summer. I provide compliance test oversight for 3M manufacturing facilities and help facilities prepare for air pollution control device compliance tests. Process conditions at the time of the tests are one of my primary concerns. After several lengthy discussions about the test conditions for an upcoming volatile organic compound (VOC) destruction efficiency test, I flew across country to discuss the test conditions.

So this brings us to the conclusion. Supervisors and managers, I cannot encourage you enough to support your young professionals with professional development courses in soft skills. In our careers, we develop technical niches and professional relevance through exposure to projects. However, without a solid foundation of clear and concise communication skills, the smartest professional cannot effectively communicate their expertise to clients or stakeholders. I have been very fortunate in my career to work with an employer who understands this value and encourages my participation with these classes. By improving my soft skill sets, I am a more effective professional, regardless of my age and experience.

SAVE THE DATE

On October 30, A&WMA will host a one-day YP workshop, entitled “Developing the Professional in Young Professionals.” For additional information and to register, visit www.awma.org/events-webinars/upcoming-events.
Power Plant Rule Would Threaten Economy, Industry Says

A U.S. Environmental Protection Agency (EPA) proposal to regulate carbon dioxide (CO₂) emissions from existing power plants would drive up electricity costs and cause significant job losses without providing a tangible climate benefit, coal-reliant states and industry groups said at a public hearing July 29.

“The U.S. cannot go it alone and expect that our actions will have a meaningful climate impact in a world economy that is using more coal and more fossil fuels every day,” Paul Cicio, president of Industrial Energy Consumers of America, said at a hearing in Washington, DC.

Utilities and industry groups called on EPA to conduct further economic analysis of its proposal before issuing a final rule. Environmental groups largely supported the proposal, but pushed EPA to seek greater emissions reductions from the power sector through increased investments in renewable generation and demand reduction programs.

“Protecting our children from carbon pollution is your legal duty and our moral obligation,” Greg Dotson, vice president for energy policy at the Center for American Progress, said.

EPA’s proposed standards would set a unique CO₂ emissions rate for the power sector in each state (RIN 2060-AR33). The states would administer the standards under Section 111(d) of the U.S. Clean Air Act. EPA anticipates its proposal could reduce CO₂ emissions from the existing fleet of power plants by 30% from 2005 levels by 2030 at a cost to the power industry of $5.4 billion to $8.8 billion in 2030 (79 Fed. Reg. 34,959).

Job Losses Feared
Rep. Shelley Moore Capito (R-W.Va.) pledged to continue to oppose EPA’s proposed rule in Congress and criticized the agency’s failure to hold public listening sessions on the rule in coal-producing states.

“By not coming to West Virginia, to Kentucky, to the coal-producing and coal-consuming states, you send a message that our views and our experiences don’t matter;” she said. “To have the federal government refuse to listen to that segment is frustrating and demoralizing for us.”

EPA also accepted public comments at hearings in Atlanta and Denver July 29.

Coal proponents said the emissions rates EPA has proposed would largely preclude states from relying on coal-fired generation. EPA Administrator Gina McCarthy has said the proposal would allow coal-dependent states to continue to rely on coal-fired generation.

Capito predicted EPA’s proposed rule could increase electricity prices and cause significant job losses in West Virginia, which produces 95% of its electricity from coal.

Unions also were concerned about potential job losses as coal-fired power plants retire in response to EPA’s proposed carbon dioxide standards, as well as other emissions limits for power plants. Bruce Burton, representing the International Brotherhood of Electrical Workers, said 40% of the existing coal power plant fleet is expected to retire as result of EPA’s CO₂ proposal and existing mercury and air toxics standards (MATS). That equates to 400,000 lost jobs, he said.

Additional Analysis Needed
Shifting electricity generation from coal to natural gas presents reliability concerns because natural gas cannot be stockpiled, Cicio said. Rising electricity prices could cause more manufacturers to offshore their operations, which could actually increase emissions, he said. Cicio said EPA needs to consider this “carbon leakage” when it tallies the benefits of its proposal.

“We need to be honest with each other. There will be jobs created in the renewable energy sector...
and other sectors, but there will be job losses in other sectors,” Jeffrey Holmstead, a partner at Bracewell & Giuliani LLP, who represents the power industry, said on behalf of the Electric Reliability Coordinating Council.

Mary Martin, of the U.S. Chamber of Commerce, said EPA has not sufficiently evaluated what impacts its proposal would have on small businesses. She called on EPA to convene a small business review panel under the Regulatory Flexibility Act and further evaluate the impact its regulations have on employment as required by Section 321 of the Clean Air Act.

Environmental Groups Want Stronger Rule
Environmental groups supported EPA’s proposal, but argued the agency could do more to encourage the use of renewable energy and energy efficiency measures. Industry groups historically have overestimated the cost of complying with air pollution regulations, environmental groups said.

“Industry has certainly done their best to scare the public,” Fred Krupp, president of the Environmental Defense Fund, said. “They do it every time we try to make the air cleaner. Every time their predictions have been flat wrong.”

Despite their protests, environmental groups said power plants have been able to deliver cost-effective emissions reductions under EPA regulations in the past.

States Praise Outreach
State air pollution regulators also supported EPA’s proposal, but asked the agency to extend the compliance deadline for states that may need to take legislative action to comply.

Additionally, state regulators said that EPA’s proposed rule may not give states that already have taken steps to address greenhouse gas emissions enough credit for those measures.

Praise for State Outreach
Bill Becker, executive director of the National Association of Clean Air Agencies, praised EPA for its outreach to states prior to proposing the rule.

The rule will provide state air pollution regulators with the flexibility to develop the compliance plans that best suit their needs. “EPA not only engaged in discussion, it also listened carefully to what was said,” Becker said.

Supreme Court Cited
Opponents of EPA’s proposed rule argued that the U.S. Supreme Court had recently cautioned EPA about reading its ability to regulate greenhouse gases too broadly.

“When an agency claims to discover in a long-extant statute an unheralded power to regulate ‘a significant portion of the American economy,’ Brown & Williamson, 529 U. S., at 159, we typically greet its announcement with a measure of skepticism,” Justice Antonin Scalia wrote in a recent opinion that limited the scope of EPA’s greenhouse gas permitting program (Util. Air Regulatory Grp. vs. EPA, 2014 BL 17297, U.S., No. 12-1146, 6/23/14).

Matt Schlapp, chairman of American Conservative Union, argued EPA’s interpretation of its authority to regulate power plants under Section 111(d) of the Clean Air Act is overly broad. Instead, he said Congress should take action to address climate change. “If the goal is to make sound policy, our democratic system is the right system to use, not bureaucratic fiat,” he said.
EPA could actually delay taking action on climate change if its rule is too ambitious and is eventually struck down by the courts as unlawful, Holmstead said. “The Supreme Court has not given EPA a roving mandate to do whatever it thinks is best,” he said.

Democrats Support Proposal

Sen. Ed Markey (D-Mass.), who authored a greenhouse gas cap and trade bill in 2009, said Massachusetts already has reduced CO2 emissions from its power plants by 40% from 2005 levels, as part of the Regional Greenhouse Gas Initiative, demonstrating EPA’s proposal is feasible.

“America must lead. History calls us to reduce greenhouse gases and unleash a clean energy revolution,” he said.

Delaware Gov. Jack Markell (D) argued that states can transition to a cleaner electricity generator sector without disrupting the economy, citing his own state’s experience. “We know this in Delaware where we’ve shifted from one of the dirtiest energy mixes in the nation to one of the cleanest,” he said.

Sen. Jeff Merkley (D-Ore.) called climate change “a direct assault on rural America” because warming temperatures already are impacting forestry and fishing jobs in his state. “If you talk to foresters in Oregon, climate change is not some distant threat. It’s happening now,” he said.

Other Democrats touted EPA’s estimate the proposal would provide between $55 billion and $93 billion in health benefits in 2030.

EPA will accept written comments on the proposed rule until October 16. Comments can be made online at http://www.regulations.gov (Docket No. EPA-HQ-OAR-2013-0602). —By Andrew Childers, Bloomberg BNA

Great Lakes Oil and Gas Environmental Conference

November 5-6, 2014 | Ann Arbor, MI

The Air and Waste Management Association (A&WMA) invites you to attend the Great Lakes Oil and Gas Environmental Conference to be held on November 5-6, 2014 in Ann Arbor, Michigan.

This two-day inter-disciplinary conference covers current environmental issues related to oil and gas in the Great Lakes region. Four session tracks focus on air, water, waste and pipeline issues and include presentations on fracking, air emissions, water reuse and remediation, compliance, regulations, permitting, and the latest technology. High level speakers from industry as well as the National Wildlife Foundation, EPA, Michigan Office of the Great Lakes, Michigan Oil and Gas Association, American Petroleum Institute, and more will present solutions from a variety of perspectives.

Conference Location
Sheraton Ann Arbor
3200 Boardwalk Street
Ann Arbor, MI 48104

Featured Speakers
• Valerie Brader, Deputy Legal Counsel and Senior Policy Advisor to Governor Rick Snyder
• Richard Ranger, Senior Policy Advisor, American Petroleum Institute
• Paul Collins, Associate, Miller Canfield Paddock Stone

For more information on this conference please visit www.awma.org/greatlakes.
EPA Seeks Input to Improve Chemical Facility Safety and Security

In the wake of the explosion at a Texas fertilizer plant last year, President Barack Obama signed Executive Order (EO) 13650 Improving Chemical Facility Safety and Security to improve the safety and security of chemical facilities and reduce the risk posed by accidental releases of hazardous chemicals to facility workers and operators, communities, and responders.

One EO requirement is for the U.S. Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA) to review the chemical hazards covered by their existing risk management programs and develop options to improve those programs. OSHA issued a request for information (RFI) on potential changes to its Process Safety Management (PSM) standard on December 9, 2013. EPA has now also issued an RFI, which closely coordinates with the potential changes to OSHA’s PSM program for accident prevention measures.

There are a number of items in OSHA’s RFI, which are relevant to EPA’s RFI. Those items include potentially updating the list of substances regulated under EPA’s Risk Management Program (RMP). The list of regulated substances currently consists of two categories of chemicals: 77 toxic substances and 63 flammable substances. The agency is requesting information on whether the list of regulated substances should be modified by adding other toxic or flammable substances; high and/or low explosives; ammonium nitrate; reactive substances and reactivity hazards; other categories of substances; removing certain substances from the list or raising their threshold quantities; and/or lowering the threshold quantity for substances currently on the list.

EPA is also seeking comments on a number of other topics, including consideration of using inherently safer technology, requiring emergency drills to test a source’s emergency response program or plan, identifying the need for automated detection, and monitoring for releases of regulated substances; addressing facility location (siting) risks; requiring the establishment of safety buffers for new facilities and safety criteria for siting of occupancies inside the facility; revising the compliance with emergency response program requirements in coordination with local responders; investigation into “near misses” or past incidents that could have caused a disasters; revising worst-case release scenario quantity requirements for processes involving numerous small vessels stored together; enhancing public disclosure of information to promote regulatory compliance and improve community understanding of chemical risks; revising threshold quantities and off-site consequence analysis endpoints for regulated substances based on Acute Exposure Guideline Level toxicity values; adjusting Program 3 NAICS codes based on RMP accident history data; adopting the “Safety Case” Regulatory Model to replace the RMP regulations; and streamlining RMP requirements.

EPA is requesting information and data on specific regulatory elements and process safety management approaches, and the public and environmental health and safety risks they address. Commenters should include specific information about any technical feasibility issues or implementation challenges associated with any of the possible revisions discussed in this RFI. EPA also welcomes input on which potential amendments to regulatory requirements should be given priority for further development along with the basis for such prioritization. For example, identify those issues posing a greater safety risk than others; those requiring less time or effort to amend; those with less costs to industry; or other reasons. The information received will be used when reviewing chemical hazards covered by the RMP and to determine how this program should be expanded to improve chemical facility safety. The RFI does not commit the agency to rulemaking.

James N. Pitts, Jr.

Dr. James N. Pitts, Jr., a long-time member of A&WMA, died on June 19, 2014, of natural causes. Dr. Pitts was born in Salt Lake City, UT, on January 10, 1921. The family moved when he was six months old to Los Angeles, which made him a "native Californian within experimental error," as he often liked to say. He attended Manual Arts High School and then University of California, Los Angeles (UCLA), where he was introduced as an undergraduate to research in photochemistry by Professor F.E. Blacet. After the attack on Pearl Harbor, Professor Blacet took a leave to become part of a civilian chemical corps for the National Defense Research Committee (1942–1945); he asked Dr. Pitts to join the group, working on the development of gas masks to protect Allied troops in the field.

After the war ended, Dr. Pitts returned to UCLA to finish his B.S. and then in 1949, his Ph.D. During this time, he did one of the first science shows on Los Angeles television with Arnold Miller, also in the Blacet research group. He married Nancy Quirt in 1946 and joined the faculty at Northwestern University in 1949. He thoroughly enjoyed Northwestern and his colleagues there, but the weather was a challenge for a California family. Thus, it was with some regret, but also with enthusiasm for taking on new challenges, that he returned to California in 1954 as a founding faculty member of the new University of California, Riverside campus. His research focused on fundamental photochemistry, and in 1966 he co-authored with Jack Calvert a book that remains a classic in that area. He held an M.A. degree from Oxford, where he spent two sabbatical leaves, in 1961 as a Guggenheim Fellow at University College and in 1965 as a Research Fellow and undergraduate tutor at Merton College.

In the 1960s, he became interested in the new field of air pollution, which was recognized as being driven by photochemical reactions as yet unknown. He was a co-founder in 1961 of the University of California Statewide Air Pollution Research Center (SAPRC), and he became its Director in 1970. He continued in this position until his retirement in 1988. During this time, SAPRC became an internationally known center for research in air pollution and the work carried out there largely laid the groundwork for the development of the new field of atmospheric chemistry.

There are few atmospheric problems today that do not have Dr. Pitts’ early fingerprints on them. He co-authored 380 scientific publications and four books, two of which are on atmospheric chemistry co-authored with his second wife, Barbara Finlayson-Pitts. He was designated one the “Most Highly Cited Researchers” by the Institute for Science Information. His scientific perception, vision and enthusiasm inspired a number of generations of young scientists, many of whom went on to win awards themselves, including in one case, a Nobel Prize. The research carried out by his team provided much of the scientific basis of California’s forward-looking policies and regulations, which have been widely adopted both nationally and internationally, and which led to the dramatic improvement in air quality we enjoy today.

He was always willing to testify to state and federal legislative bodies regarding the science of air pollution, and to provide informal advice to a variety of stakeholders. He received many commendations and accolades both for his science and for its translation into policy for the public good. These included recognition from the California Assembly, the South Coast Air Quality Management District, and the U.S. Congress. He was a member of, or chaired, a number of statewide committees for the California Air Resources Board, including the Acid Deposition Committee and the Scientific Review Panel on Airborne Toxic Chemicals. He had a firm policy of not accepting consultantships or support from industry that would give even a hint of perception of bias in his translation of science into public policy.

His accomplishments and contributions were recognized with many awards, including the 1973 Orange County Section of the American
Chemical Society Service Through Chemistry Award; the 1979 California Lung Association Clean Air Award; the 1982 Air Pollution Control Association Frank A. Chambers Award; the 1983 Richard C. Tolman Medal of the Southern California Section of the American Chemical Society; 1983 Fellow of the American Association for the Advancement of Science; 1984–1985 F. J. Zimmermann Award in Environmental Science, Central Wisconsin Section, American Chemical Society; 1992 Lifetime Achievement Clean Air Award from the South Air Quality Management District; 2002 Haagen-Smit Award from the California Air Resources Board for Outstanding Contributions to Air Pollution Science; and the 2007 Carl Moyer Award from the Coalition for Clean Air for Scientific Leadership and Technical Excellence.

In 1994, he was warmly welcomed at the University of California, Irvine (UCI) as a researcher when his wife, Barbara Finlayson-Pitts whom he married in 1976, moved to UCI as professor of chemistry. At UCI, he played a central role in mentoring at all levels, and particularly enjoyed interactions with undergraduate and graduate students.

Dr. Pitts was an enthusiastic tennis player. He was also a life-long fisherman and bird hunter, with a love of the outdoors that was instilled by trips to the High Sierras at a young age with his parents. For a number of years, he organized for friends chartered deep-sea fishing trips of several days duration; the neighborhood would anxiously await his return as they knew fresh fish would be generously shared. He and Barbara were “parents” to a series of Golden Retrievers and a Labrador Retriever that were hunting companions as well as family members. Their home in Fawnskin was the focal point for many of their outdoor activities, including photography of bald eagles and day trips around the mountains and surrounding desert, and a gathering point for friends and family.

Dennis Clark Gehri

Dr. Dennis Clark Gehri, one of the original patent holders of the Dry SO₂ Control System using the Aqueous Carbonate Process (spray dryer), died on June 28, 2014. Dr. Gehri’s patent and subsequent work while at Rockwell International and its many offshoots have contributed greatly to reduction of pollution, especially in coal-burning power plants.

Dr. Gehri obtained both his undergraduate degree with honors (1959) and doctoral degree (1967) in chemistry from the University of Wisconsin, Madison. From 1959 to 1962, he proudly served his country in the U.S. Air Force. Dr. Gehri was an Air Force weapons and explosives instructor in Denver and was honorably discharged at the rank of First Lieutenant.

Dr. Gehri was employed by Rockwell International from 1968 to 1993, as a research scientist. His proudest work was that which culminated in a U.S. patent for the removal of harmful sulfur emissions from coal-fired power plants. At the end of his career, he worked at the Rockwell “Think Tank” assisting in the development of materials used on the Space Shuttle and the National Aerospace Plane. After his retirement from Rockwell International, Dr. Gehri taught chemistry at Moorpark College, California Lutheran University, and Pepperdine University. He fully retired from teaching in 2012.
Changing of the Guard for A&WMA’s Publications Committee

Mike Kleinmann (left) presents Naresh Kumar with a certificate of appreciation for his service as Chair of the Editorial Review Board (2011–2014) during A&WMA’s Annual Conference & Exhibition in June. In addition, Kleinmann completed his term as Chair of the Publications Committee (2011–2014) in June and, in doing so, passed the committee reins over to Kumar.

Professional Development Courses

The Air & Waste Management Association is recruiting instructors to be a part of the Professional Development Course program at the 2015 Annual Conference in Raleigh, North Carolina on June 21-25, 2015.

A&WMA is seeking courses in the following areas/topics:

- Air Pollution and Control
- Modelling and Monitoring
- Environmental Management
- Air and Waste Management
- Air and Waste Regulatory Compliance and Permitting
- QEP Prep
- Any other area of interest in line with the mission and goals of A&WMA

If you are interested in teaching a course, please visit http://ace2015.awma.org/courses and fill out a Course Proposal form.

The deadline for submission is Monday, December 15, 2014.

CALL FOR ABSTRACTS

For the Air & Waste Management Association’s
108th Annual Conference & Exhibition

The Air and Waste Management Association (A&WMA) is proud to announce that the 108th Annual Conference & Exhibition (ACE) will be held June 22–25, 2015, at the Raleigh Convention Center in Raleigh, North Carolina. The theme for the 2015 ACE is Connecting the Dots: Environmental Quality to Climate to consider the relationships between environmental quality and climate. The Conference’s Critical Review will be on the “Interplay between Air Pollution and Climate.” We are pleased to invite abstracts of original work on important and timely environmental issues reflecting the nexus of economic, social, scientific and political pressures shaping and forming international environmental policy and decision-making.

Raleigh, NC, is only a few minutes away from EPA’s largest research facility and the home of EPA’s Office of Air Quality Planning and Standards in Research Triangle Park. Mark your calendars for 3.5 days of professional growth and camaraderie with hundreds of the best minds in our profession.

Why You Should Present!

The conference is typically comprised of more than 400 platform and poster presentations and 40 panel sessions. With up to 50 technical sessions per day and as many as 12 concurrent sessions, it is recognized as the premier international conference of its kind providing the latest information on air and waste issues.

This is your opportunity to share your work at a technical conference, enhance the knowledge base of the industry, hear panel discussions of late breaking topics, and interact with an engaged audience of your peers, including: industry practitioners, consultants, regulators, students and researchers.

Original work documenting research, governmental, and industrial issues and solutions are especially desired. Papers consistent with our theme on environmental interactions such as the relationship between climate change and air quality, regulatory reforms, and new research and technology developments are encouraged. Additional areas and categories of interest are outlined in this Call for Abstracts by major topic areas and some example subtopics. The abstract submission site (accessed via http://ace2015.awma.org) has a more comprehensive subtopic list. A Mini-Symposium consistent with the conference theme will also be featured running throughout the conference (see below):

2015 Mini-Symposium – Regulatory Directions: Environmental Benefits, Societal Impacts, and Future Outlook

The 2015 Mini-Symposium will focus on U.S. regulatory policy in climate, air quality, and waste management. A&WMA invites proposals from the industrial, governmental, and environmental communities for a series of sequential paper and panel sessions. The Mini-Symposium will address the U.S. environmental regulatory framework, discuss realized environmental and climate benefits, examine compliance challenges faced by the regulated community and implementation challenges faced by regulators, scrutinize societal impacts including but not limited to economic, land use planning, and co-benefits or other consequences, and provide a forum for comments from the stakeholder industrial, governmental, and environmental communities.
How to Submit an Abstract:

All abstracts must be submitted no later than November 3, 2014, using the abstract submission website. Detailed information, additional potential session topics, and a link to the abstract submittal site can be found at the conference website: [http://ace2015.awma.org](http://ace2015.awma.org). All abstracts (platform, poster and panel) are peer reviewed and evaluated on the basis of: technical quality; relevance and significance to current environmental issues; and absence of commercialism.

Accepted submissions for the 2015 conference will be presented via platform or poster format. The program will include a poster-only session scheduled in a dedicated time slot, with no competing platform or panel sessions.

An extended abstract or full manuscript is required for each accepted platform or poster abstract, which will be published in the conference online proceedings, regardless of presentation format. Refer to the 2015 Technical Program Timeline for key dates and deadlines.

Submission Process

**Step 1:** Use AWMA’s online submission site http://ace2015.awma.org, which will include information to guide you through the process. The listing of planned session topics along with general topic areas can be found at the online submission site to assist you with abstract submission.

**Step 2:** If you have been invited to submit an abstract in a specific area or for a specific session, check the solicitation box on the form, and be sure to select the name of your contact.

**Step 3:** Double check that your contact information is entered correctly; this is our only way of contacting you regarding your submission.

A&WMA policy stipulates that all authors who attend the conference must register for the conference and pay the appropriate registration fees.

We hope to see you in Raleigh, NC for A&WMA’s premier event, our 108th Annual Conference and Exhibition.

*Sara Head, Technical Program Chair
Leo Stander, Technical Program Vice Chair*

PROPOSED TOPICS FOR ABSTRACTS

**Conference Theme, Local and Hot Topics**

- Challenges Facing Air Quality Regulators and Industry
- Climate/Air Quality Interactions
- Greenhouse Gas PSD/BACT Issues
- Clean Power Initiatives
- Indoor Air Challenges
- IPCC Results and Climate Action Plans
- NAAQS Update – Revised Standards for Ozone and Particulate Matter
- Oil, Gas and Hydraulic Fracturing: Impacts and Implications of Exploration and Future Production
- Ozone and Long Range Transport
- Transport Rule

**Air Quality Issues**

**Atmospheric Chemistry**

- Atmospheric Chemistry and Deposition
- Atmospheric Secondary Pollutants
- Wintertime Ozone Issues

**Atmospheric Modeling and Meteorology**

- AERMOD Modeling/Case Studies
- Air Dispersion Modeling Issues and Guidance
- Photochemical Modeling Issues
- Source Apportionment

**Control Technologies**

- Air Pollution Control for Particulate Matter and Mercury
- Air Pollution Control – Acid Gases, NOx, and VOCs
- GHG/CO2 Control Technologies and Strategies

**Emission Inventory and Data Application**

- Air Emission Surveys
- Emission Factor Development
- PM2.5 Speciation in Emission Estimates – Measurements, Data Gaps, and Challenges

**Measurement Technologies and Instrumentation**

- Ambient Air Monitoring Methods and Study Results
- Next Generation of Air Monitoring Tools for Fugitive and Area Source Emissions
- Satellite Measurements for Environmental Monitoring

**Particulate Matter**

- Analysis of Ambient Particulate Matter Data and of Method Evaluation Results
- Carbonaceous Particulate Matter
- Fugitive Dust

**Visibility and Radiative Transfer**

- Topics in Visibility and Policy Implications
- Regional Haze State Implementation Plans
- Visibility Studies

**Nanotechnology**

- Developments in Nanoscale Science, Engineering and Policy
- Nanotechnology Research, Development and Applications
- Measurement, Analysis and Regulatory Developments
Environmental Management

Community Noise and Vibration
• Airport Environmental Design Tool 2B – A New Tool for Noise and Air Quality Analysis for Airports
• Mitigation Strategies for Noise Impacts from Industrial and Transportation Sources

Health Effects and Exposure
• Health and Environmental Effects – Toxics and HAPs
• Health Effects Due to Urban Air Pollution
• Toxic Air Pollutant Exposures

Odors
• Air and Odor Emissions from Animal Production
• What is an Odor? – How is it sampled, how is it measured?

On and Off Road Mobile Sources
• Measurement and Modeling of Near Road Air Quality
• Mobile Source Modeling – MOVES 2014
• Reducing Emissions from Rail Passenger Service
• Vehicle and Engine Emissions and Controls

Public Participation, Economics, and Partnering
• Real Time Air Quality Information and Citizen Science
• Challenges in Education, Training, and Outreach

Regulations, Legal Issues and Permitting
• Air Permit Compliance
• Air Toxics Regulations and Policies – Development and Implementation
• NSR/PSD Permitting
• Recent Court Rulings and Their Implications for Facilities
• Status of NSPS/NESHAP for Industrial Sectors
• International Regulatory Issues
• Visible Emissions Observation Training and Certification

Risk Assessment and EHS Management
• Environmental Management Systems
• Human Health Risk Assessment Studies
• Residual Risk and Technical Reviews
• Risk Communication

Transportation and Land Use
• ISIS Models
• Local/International Goods Movement
• Sustainable Transportation

Industrial, Government and Public Sectors

Chemical Petroleum
• Hot Topics in the Chemical and Refining Industries
• MACT Issues: Flares, Leaks, and Enforcement Priorities
• Emissions, Impacts, and Control Technologies Related to Oil and Gas Exploration and Production

Federal Facilities
• DoD Environmental Compliance Issues and Policies
• Strategic Sustainability Performance Planning at Federal Facilities and the Public Sector
• Compliance Information Management Challenges and Solutions

Indigenous Environmental Affairs
• Tribal Projects in Sustainability
• Tribal Minor NSR and Its Impact in Indian Country

Industrial Furnaces and Boilers
• Implementation of Utility and Boiler MACTs

Mineral Extraction and Processing
• Issues in Mineral Extraction and Processing
• Issues in Mineral Exploration and Assessment

Power Generation and Renewable Energy
• Coal Ash Management and Disposal
• Energy Sources Development & Environmental Regulations
• Heat and Energy Recovery
• Renewable Energy

Sustainability, Climate Change, Resource Conservation and Waste Management

Climate Change Impacts and Adoption
• Climate Change Sustainability Challenges
• Methane/Waste Issues
• The Impact of Climate Change on Technology Selection for Air Pollution Treatment

Climate Change Policy, Strategy, and Regulations
• Corporate Climate Change Strategies
• Federal and State Methane Control Requirements
• Voluntary Climate Change Programs

Resource Conservation
• E-Waste Management
• Recycling and Diversion Programs
• Zero Waste Infrastructure and Systems, Economics, Funding, and Payback

Sustainability
• Sustainability Programs in the Waste and Energy Fields
• Sustainability Models to Engage Employees & Stakeholders
• Sustainability Reporting Standards

Waste Characterization and Site Remediation
• Managing Brownfield Agreements During Site Development
• Site Remediation
• Waste Characterization, Treatment and Beneficial Use
• U.S. Efforts to Adapt to International Hazardous Material Identification, Management and Reporting Standards

Waste Resource Recovery, Processing, and Bioenergy
• Anaerobic Digestion and Composting of Wastewater Sludges, Food Wastes, Agricultural Wastes and MSW
• Ash Management and Beneficial Reuse
• Bioenergy Technology, Biomass Combustion and Biofuels
• Lifecycle Impacts of Waste-to-Energy and Bioenergy, including GHG Emissions
• Municipal Waste and Wastewater Residuals Processing and Management
• Non-hazardous Waste Processing and Management – Industrial Liquids, Ash, and Manure
• Waste to Energy and Waste Conversion Technologies
Listed here are the papers appearing in the October 2014 issue of EM's sister publication, the Journal of the Air & Waste Management Association. For more information, go to www.tandfonline.com/UAWM.

Technical Papers

- An extended approach to calculate the ozone relative response factors used in the attainment demonstration for the National Ambient Air Quality Standards
- Airborne polycyclic aromatic hydrocarbons in a medium-size city affected by pre-harvest sugarcane burning
- PM$_{10}$ concentration levels at an urban and background site in Cyprus: The impact of urban sources and dust storms
- Comparison of variability in dioxin and furan data acquired using single train and simultaneous multiple train stack sampling methods
- Laccase production by *Phomopsis liquidambari* B3 cultured with food waste and wheat straw as the main nitrogen and carbon sources
- Planning of methane emission control from hoggery using an inexact two-stage optimization model
- Treatment of hydrophobic VOCs in trickle bed air biofilter: Emphasis on long-term effect of initial alternate use of hydrophilic VOCs and microbial species evolution
- The accuracy of two- and three-way positive matrix factorization models: applying simulated multi-site datasets
- Heavy-duty, off-road diesel engine low load particle number emissions and particle control
- Estimating and comparing greenhouse gas emissions with their uncertainties using different methods: A case study for an energy supply utility
- A two-step approach for relating TEOM and dichotomous air sampler PM$_{2.5}$ measurements
- Future year ozone source attribution modeling studies for the eastern and western United States

Events sponsored and cosponsored by the Air & Waste Management Association (A&WMA) are highlighted in bold. For more information, call A&WMA Member Services at 1-800-270-3444 or visit the A&WMA Events Web site: www.awma.org/events.

To add your events to this calendar, send to: Calendar Listings, Air & Waste Management Association, One Gateway Center, 3rd Floor, 420 Fort Duquesne Blvd., Pittsburgh, PA 15222-1435. Calendar listings are published on a space-available basis and should be received by A&WMA’s editorial offices at least three months in advance of publication.

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The Air & Waste Management Association bestows 10 achievement awards annually, presented at the Honors & Awards Ceremony during the Association’s Annual Conference & Exhibition.

Please consider whom you might nominate for the awards to be presented in 2015.

The deadline for complete nomination material will be October 31, 2014.

Awards A&WMA members can nominate for:
- Charles W. Gruber Association Leadership Award
- Fellow A&WMA Membership
- Honorary A&WMA Membership
- Outstanding Young Professional Award
- Richard C. Scherr Award of Industrial Environmental Excellence

Awards anyone can nominate for:
- Frank A. Chambers Excellence in Air Pollution Control Award
- S. Smith Griswold Outstanding Air Pollution Control Official Award
- Richard Beatty Mellon Environmental Stewardship Award
- Lyman A. Ripperton Environmental Educator Award
- Richard I. Stessel Waste Management Award

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