# Meeting Minutes

# Air Toxics Science Advisory Committee
## Meeting No. 7

June 17, 2015 (9 am to Noon, PDT)
Conference Room EQC-A, 10th Floor, DEQ HQ
811 S.W. Sixth Avenue
Portland, Oregon 97204

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Department of Environmental Quality

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### List of Attendees

ATSAC members in attendance: Bill Lambert, Kent Norville, Dean Atkinson, Max Hueftle, Bruce Hope, David Farrer. Dave Stone is absent.
DEQ staff in attendance: Sue MacMillan, Sarah Armitage, Phil Allen, Kevin Downing,
Audience members on phone: Steve Hill, Sierra Research; Mike Freese, Associated Oregon Industries; Matt Davis, Environmental Health Program in the Washington County Public Health Division

The seventh meeting of the 2014/2015 Air Toxics Science Advisory Committee (also referred to as the ATSAC) took place from 9 am to noon on June 17, 2015 in Conference Room EQC-A at DEQ headquarters, 811 SW Sixth Avenue, Portland, Oregon. ATSAC Committee member Dave Stone was absent.

### Introduction and Administrative Items

Bill Lambert reminded the committee and the audience of what happened at the May ATSAC meeting, which included technical presentations by four speakers: Dr, Staci Simonich, Dr. Kim Anderson, Mr. Kevin Downing, and Mr. Anthony Barnack who discussed aspects of setting, physics, and chemistry for polycyclic aromatic hydrocarbons (also referred to as PAHs) and diesel, rather than toxicological information. Lambert pointed out that the April meeting minutes had yet to be resolved, and that the May meeting minutes are still pending. He assumed that the committee would deal with these items at the July ATSAC meeting. He mentioned that the agenda for today's meeting was published in advance and includes discussion focused on toxicological aspects of PAHs, and discussion of some potential approaches for arriving at ambient benchmark concentrations (also referred to as ABCs) for the group of compounds being discussed.

### Polycyclic aromatic hydrocarbons (PAHs)

Bruce Hope began the technical part of the meeting with his presentations on PAHs, including a proposal he had created. Although Dave Stone was not present, Bruce Hope mentioned that he had worked with Dave Stone prior to today's meeting to create the slides and ideas for PAHs. He emphasized that the PAH proposal he was presenting was only that: a proposal. He listed the five points that were highlighted in his slides during the May ATSAC meeting: 1) an index PAH exists, which is benzo(a)pyrene; 2) the unit risk estimate related to the index PAH; 3) PAHs to be monitored and measured; 4) relative potency factors to relate other PAHs to the index PAH; and 5) consideration of source attribution based on composition and type of PAHs present in air samples. Hope mentioned that the ATSAC choosing to continue to use benzo(a)pyrene as the index PAH makes sense, as national and European agencies also use this PAH as the index PAH.

Bruce Hope explained that the current Oregon ABC is based on work done in California back in 1998, which resulted in a unit risk estimate of 1.1 x $10^{-3}$ per micrograms per cubic meter, which converts to an ABC of 0.0009 micrograms per cubic meter. From this point on in the minutes, micrograms per cubic meter will be referred to as ug/$m^3$. USEPA's Integrated Risk Information System databased (typically referred to as IRIS) recently looked at some new toxicity information, and then proposed a new unit risk estimate of 6 x $10^{-4}$ per ug/m3 (or 0.0006 per ug/m3) for benzo(a)pyrene in their 2014 External Review Draft document, a value which converts to a protective concentration of 0.002 ug/m3. This conversion is calculated by dividing the acceptable carcinogenic risk, 10-6, or 0.000001, by the unit risk estimate. This newly-published unit risk estimate appears to indicate that the committee could now recommend the use of the related higher concentration as the ABC for total PAHs. However, in the intervening years, a subset of the PAHs have been recognized as having mutagenic properties, including the index PAH, benzo(a)pyrene, which is the PAH by which other PAHs are judged in terms of relative toxicity. In these cases, EPA recommends that the unit risk estimates be age-adjusted based on mutagenic effects, which are theorized to impact children more drastically than adults.

The EPA has draft guidance that explains how to age-adjust unit risk estimates for mutagenic PAHs (External Review Draft of *Development of a Relative Potency Factor [RPF] Approach for Polycyclic Aromatic Hydrocarbon [PAH] Mixtures*, published in February 2010). Following that guidance, a human lifetime of exposure is broken down into three difference age-related cohorts using age-dependent adjustment factors, also referred to as ADAFs. For children from 0 to 2 years old, an ADAF of 10 is used; for children from 2 to 16 years old, an ADAF of 3 is used; for people older than 16, an ADAF of 1 is used. So, for example, in this case, young children under two years of age are deemed to be ten times more susceptible to this mutagenic chemical than adults. The simple formula provided in the document can be used to back-calculate to an air concentration of PAHs that is protective to a 1 x $10^{-6}$ cancer risk, and the concentration will now be based on the inclusion of age-adjusted information. When this this age-adjustment is calculated, when the aforementioned unit risk estimate of 6 x $10^{-4}$ per ug/m3 is used as one of the parameters, the resulting concentration is 0.001 ug/m3, which is protective to a 1 x $10^{-6}$ cancer risk. This concentration of 0.001 ug/m3 is very close to the current ABC value for total PAHs of 0.0009 ug/m3, and in fact would be the same value if 0.0009 were rounded up, to 0.001. Thus, our proposal is that this new EPA-recommended unit risk estimate be adopted as the ABC for PAHs -- but in order to do this, we would have to use the age-adjustment protocol. But when we do this, we find that we end up with the same ABC value that we currently have, except now the ABC value will be more up-to-date, because it includes consideration of mutagenic effects.
The current ABC value for total PAHs is based on the assumption that the mixture of total PAHs to which the ABC applies contains 32 PAHs. Hope proposed that a revised ABC now be based on only 25 PAHs, including benzo(a)pyrene, which USEPA requires DEQ to monitor, along with naphthalene (but naphthalene has its own ABC and so is not included in the list for total PAHs); 14 PAHs that EPA requests that DEQ monitor, as was discussed by Anthony Barnack at the May ATSAC meeting; and 10 PAHs (specifically relevant to air) obtained from the list provided by the Minnesota Department of Health.

In 2014, the Minnesota Department of Health put out a revised guidance document suggesting that the measurement of 19 PAHs would be relevant for identifying PAHs emitted from air sources. Some of the PAHs included in the Minnesota Department of Health list are 30 to 50 times more potent (in terms of carcinogenicity) than benzo(a)pyrene. Minnesota goes beyond the typical EPA list of 16 PAHs, which has served well for soil and sediment studies historically, but are not all relevant to PAHs in air.

Bruce Hope explained that the proposed list attempts to capture PAHs that are from different sources, whether they are internal combustion engines, wood stoves, ether oil boilers, or others. Thus, although we're decreasing the number of PAHs that undergird the ABC for DPM from 32 to 25, the 25 that we are proposing are specific to air. In order to be able to relate the toxicity of each of the proposed 25 PAHs to the index PAH benzo(a)pyrene, we will need to find toxic equivalency factors (typically referred to as TEFs) for each of the 25 PAHS. The 2010 USEPA draft document and the Minnesota Department of Health provide TEFs for most of the PAHs. The concentration of each of the 25 PAHs is adjusted based on TEFs related to benzo(a)pyrene potency, and then the adjusted concentrations are summed. That sum then will be compared to the ABC for total PAHs, which would be 0.0009 ug/m3.

Bruce Hope proposed using the upper-bound value from each of the ranges of TEFs (which are also referred to as relative potency factors) provided in Table 1, page xi of USEPA's February 2010 draft guidance, be used TEFs for individual PAH concentration adjustments made prior to summing all adjusted PAH concentrations and comparing that sum to the ABC for total PAHs. He explained that this would allow the use of values that estimate the maximum toxicity of the group of 25 PAHs, relative to benzo(a)pyrene. In some cases, as with the PAHs 5-methylchrysene and 6-nitrochrysene, the relative potency factor provided by Minnesota would be used, as it is the only available relative potency factor available. Note that the Minnesota relative potency factors are based on a single-point value, rather than a range of values.

Bruce Hope explained that, with this proposal, we are trying to accomplish two things: 1) Provide an ordered list of PAHs which are specifically relevant to emission sources, and assume that DEQ will be able to measure all 25. It seems that this would be do-able, after hearing the presentations at the May ATSAC meeting; and 2) Propose potency factors for each of the 25 PAHs based on the high end of the ranges provided by EPA in their 2010 draft guidance. As discussed above, the concentration of each detected PAH would be converted using the appropriate TEF, then these results would be summed, and that sum would be compared to the ABC for total PAHs. By doing this, you would be able to see which PAHs stand out as the biggest contributors to the total PAH number. Theoretically, you might be able to link the biggest contributors to a particular air emissions source, or sources, which is referred to as a fingerprinting exercise. If measuring more than 25 PAHs was feasible, say 50 or 60 PAHs, then linking a group of PAHs to a particular source (fingerprinting) would likely be more feasible. But the 25 PAHs that Hope proposed might be usable for fingerprinting purposes, in some cases.

Max Hueftle pointed out that the list of 25 PAHs proposed by Bruce Hope includes perylene, rather than benz(a)anthracene. Perylene is generally not a PAH of much concern, while benz(a)anthracene typically is a concern. Hueftle wondered if this list is correct. Bruce Hope said he will need to check, because he used the 2009 Technical Assistance Document for the list of PAHs, and is not sure what the most-current Technical Assistance Document requires. Hope said that we will need to check with Anthony Barnack about this.

Also, Dave Stone knows the person at the Minnesota Department of Health who created the state PAH guidance, and he thinks that this person might be willing to call in to an ATSAC meeting to discuss details. Bruce Hope stated that the PAHs phenanthrene and pyrene are "lightly carcinogenic", but will disappear quickly in air due to their low molecular weights.

Bruce Hope pointed out that the current ABC for total PAHs is based on the California 1998 Unit Risk Estimate of 0.0011 per ug/$m^3$ (which, when converted to represent a concentration protective to a cancer risk level of 1 x $10^{-6}$, is 0.0009 ug/$m^3$). EPA (2014) IRIS is proposing a new Unit Risk Estimate value of 0.0006 per ug/$m^3$ (which converts to a protective concentration of 0.0016 ug/$m^3$, or, rounding up, 0.002 ug/$m^3$). If the ATSAC chooses to recommend use of the 2014 Unit Risk Estimate as a new ABC for total PAHs, but then age-adjusts it to account for mutagenicity of the PAHs, then the resulting value of 0.0009 per ug/$m^3$ would be  the same as the current ABC for total PAHs. In summary, other than changing the list of PAHs that undergird the ABC for total PAHs, the ABC itself will remain the same. He stated that the committee needs to make sure that DEQ is actually able to measure all 25 proposed PAHs.

David Farrer said that he really likes this relative potency factor approach for PAHs, because it's a good way to look at the total toxicity of a large group of related chemicals.

Bill Lambert stated that the proposed abbreviated PAH list has solid reasoning behind it, but that he less concerned with the fingerprinting option. Bruce Hope's proposal is very useful and health-protective, and accepted outside the venue of the ATSAC, as well. Lambert asked if the age-adjustment exercise in one of Bruce Hope's slides should be more explicitly explained.

David Farrer asked what assumption was made about the duration of a lifetime in the age-adjustment calculations. Sue MacMillan responded that a lifetime of 70 years was assumed. Farrer pointed out that more-recent guidance by USEPA recommends the use of a 75-year lifetime. Sue MacMillan said she would perform two separate sets of calculations: one based on a 70-year lifetime, and the other based on a 75-year lifetime, and then share the results with the committee. She will also double-check Bruce Hope's calculations.

Sue MacMillan will also send the committee members a link to the 2010 EPA draft guidance for relative potency factors. Bill Lambert directed her to complete the double-check, and then send the results to the committee for review, and emphasized that the review of these calculations is essential. He said that the committee can approve or disapprove of this protocol, and that the decision needs to go on record. The committee will hold a formal vote on this at the July ATSAC meeting.

Bruce Hope asked Sarah Armitage whether DEQ looked at PAHs in the Portland Air Toxics Solution work at the level of speciating different PAHs coming from different sources, or whether DEQ just applied a general emission factor to PAHs. She stated that a general approach was used, so the results truly are estimates.

Kent Norville remembered that 15 PAHs were considered in the report put out by the Portland Air Toxics Solutions committee, and the approach was a general one. Naphthalene was considered separately from the other 15 PAHs. He thought that wood smoke was the biggest contributor to PAHs in the Portland Air Toxics Solution work, and Sarah Armitage concurred.

Bruce Hope thinks the proposed approach is the way to go. It's just a matter of double-checking the calculations, and the PAHs that will comprise the list of 25. Sue MacMillan stated that she would talk with Anthony Barnack about the question of perylene versus benz(a)anthracene belonging in the list of 25 PAHs, as well as check with him regarding the feasibility of DEQ monitoring for the proposed list of 25 PAHs.

Bill Lambert summarized four action items to be completed prior to the July ATSAC meeting:
1) Consider Bruce Hope's proposal, which would result in retaining the current ABC of 0.0009 ug/m3 for total PAHs.
2) Revise list of PAHS to 25. Make sure committee is comfortable with loss of the 7 PAHs from the previous list of 32 (these 7 are not commonly a problem in air, more likely to be a concern in other media).
3) Sue MacMillan will email the committee the age-adjustment calculations that she will perform, based on two separate lifetime durations. Committee will review.
4) Sue MacMillan will talk with Anthony Barnack about which PAHs the current list of EPA-requested PAHs contains.
The committee agreed to begin the discussion of diesel particulate matter without taking a break.

## Diesel particulate matter (DPM)

Bill Lambert reminded the group of that one of the important aspects of diesel is pinning down the terminology of the measurement of diesel particulate matter as a complex mixture, and consideration of directly measurable chemical indicators or markers (such as black carbon or elemental carbon) that might be used to represent diesel particulate matter during sampling and analysis. At the May ATSAC meeting, the committee discussed competing definitions for elemental carbon versus black carbon, as well as the idea of using size-fractionated particle matter mass. The total number of particles involved appears to be important in regard to the toxicity of diesel in some of the toxicological literature. Initially, the committee talked primarily about elemental carbon and discussed its use as an indicator marker (surrogate) for diesel exhaust.

Sue MacMillan presented slides detailing the characteristics of elemental carbon and black carbon, and how they might be relatable to the monitoring of diesel particulate matter. Within the large body of literature on this topic, the terms elemental carbon, black carbon, and diesel particulate seem to be used interchangeabley in many cases, while other articles specifically differentiate between black carbon and elemental carbon. This makes this topic very confusing. For example, the analytical method provided by the National Institute of Occupational Safety and Health (commonly referred to as NIOSH), which is NIOSH Method 5040, actually titles the method as "Elemental Carbon (Diesel Particulate)".

The definition for elemental carbon that Sue MacMillan finally chose is: elemental carbon is a refractory carbon measured both optically and thermally, while black carbon is only measured optically. She also discussed another confusing phrase: "carbon black", which has shown up in a few technical articles and is mistakenly used in some cases to refer to black carbon or even elemental carbon. But "carbon black" is actually a man-made product, and not a combustion breakdown product like elemental carbon and black carbon. Bill Lambert pointed out that the other thing to remember is that the technique to measure elemental carbon also measures something called organic carbon, which is all the other carbon out there except little carbon particles.

Sue MacMillan talked about an analytical method called ECOC (which stands for elemental carbon/organic carbon) used to measure elemental carbon. The different types of ECOC method include "IMPROVE ECOC", "NIOSH ECOC", and "STN". It appears that the IMPROVE ECOC method is most used currently, and one of the papers described a lab in the

Portland area that is able to perform this analysis. Unfortunately, the analytical results for ECOC vary not only from method to method, but from laboratory to laboratory. This makes it very difficult to replicate results consistently. One of the articles that Sue MacMillan reviewed went through suggested a protocol for extrapolating diesel particular matter from elemental carbon readings, but it is unknown how often or where this protocol is used. The bottom line is that there is no way to get credible elemental carbon results that can be used to estimate diesel particulate matter levels.

Bill Lambert mentioned that the analytical results for elemental carbon are frequently attributed to diesel, because the sample was known to have been collected near a diesel engine. But without the known presence of a diesel engine, there is really no way to attribute elemental carbon results to a diesel source in a credible way. Lambert is worried that other sources of elemental, such as residential wood smoke, might be missed, which makes him leery of a method that requires correlation and prior knowledge of what it is that the results are being correlated to. Instead, we should be able to measure elemental carbon and then determine where it came from, rather than having it be a self-fulfilling measurement. Lambert also noted that the analytical methods have gotten better overall within the past 10 years, but are very expensive to run.

Bill Lambert's concern is that the committee set limits for, and be clear about, what chemical(s) the committee thinks are actually causing adverse health effects when exposure to diesel particulate matter occurs. Then the committee needs to be clear about what's possible and what's not in terms of being able to measure the chemical(s) at the analytical detection limits that are used. He questioned whether it was really necessary to consider the use of elemental carbon as a surrogate for diesel, because it seems like DEQ has made and continues to make excellent progress with the diesel emission issue regardless of the number used as a benchmark. He stated that since markers of diesel exhaust, rather than diesel exhaust itself, were being discussed, he wanted to keep related monitoring and analysis capabilities in mind.

Bruce Hope agreed, and said that he is concerned with three technical questions: 1) what components in diesel particulate matter are actually causing adverse health effects; 2) what is the protective number we need to assign to be protective of diesel exposure; and 3) how do we actually measure diesel particulate matter in air.

Bill Lambert reminded the committee that Kevin Downing, DEQ, presented a talk on diesel engines and related issues at the May ATSAC meeting. Based on that talk, there are a variety of sources of diesel exhaust that include emissions from trucks, boats, on-road sources, short- and long-haul trucks, off-road sources, construction equipment, specialty equipment, and buses. Kevin Downing's work to improve school busses is helping a vulnerable group of kids. Rail transport and train locomotives in various sectors of the city are important to consider, including both train use and switching yards, as well as container facilities and emergency power generators. When we asked Kevin Downing about what we knew of the age of these diesel engines and their life cycles, he told us about turnover of fleets having old-technology diesel engines to the post-2007 new-technology diesel engines. The newer engines have much lower emissions and these exhaust emissions contain chemicals with less-toxic carcinogenic potency, but we don't know the actual amount of engine turnover that has occurred. Kevin Downing was reluctant to commit to any particular proportions or numbers, because the data is hard to gather. There doesn't appear to be data available on the turnover particularly of trucks in our state. Generally the lifetime nationally for a diesel engine is somewhere around eight years. Kevin Downing believes it would be reasonable to assume that long-haul trucks represent the newer engines, and that older diesel engines are probably continuing to be used for short-distance transport work in the city itself. On the interstates and major highways, newer engines are expected to dominate. As time goes on, the fleets will contain greater and greater numbers of the new-technology diesel engines.

In human health risk assessment -- and this relates to our discussion of the original diesel particulate ABC -- rodent data is not considered to be a suitable model for humans at low exposures. There's quite a large literature base which strongly suggests that, experimentally, toxicity tests using rodents do not accurately simulate what happens in the human system. When rodents are tested, they are exposed to high levels of diesel particulates in order to make sure an effect occurs within the laboratory setting. In this case, then, effects could be due to a simple mechanical overload of the lungs with diesel particulates, with resulting tissue inflammation – which is completely separate from chemical effects that cause mutagenicity. Also, we don't know if just the particles themselves, or the organic compounds attached to the particles, are causing adverse effects.

But in human epidemiological studies, the effects can be more accurately assessed in terms of human exposure, because observational studies conducted in the occupational environment are the primary assessment tool. However, exposures other than diesel exhaust exposure can occur in the study setting, which can include smoking, exposure to second-hand smoke, and exposure to radon and/or metals in a mining setting, or exposure that occurs during the maintenance of diesel vehicles. Granted, exposure to chemical in the occupational setting tends to be, so it is not representative of the typically lower environmental levels experienced by the general population or by vulnerable subgroups such as women, children, the elderly, and people with chronic disease conditions. Low-dose exposure information for these groups is extrapolated from the data obtained in occupational setting.

The federal human assessment approach to toxicological review recommends these considerations, when a number of options are available (per Cogliano, 2014 Health Effects Institute Diesel Workshop):
-- Epidemiologic studies are preferred over animal studies.
-- Among animal models, use those that are most similar to the process that occurs with human responses.
-- Use studies which have assessed the relevant route of human exposure.
-- Use studies of longer exposure duration and which include follow-up.
-- Use studies with multiple exposure levels, rather than just a single exposure level.
-- Use studies with adequate technical power to detect effects at lower concentration levels.
Thus, when we use toxicity values from IRIS, which are based on exposure studies, we want to use evidence that's quantitative, and make sure that measures of dose and response are present. If they're absent in those studies, and assuming all other factors are equal, we prefer to use human epidemiologic studies. If we're forced to rely upon animal studies, we use those that demonstrate a response which is most like the response observed in humans. Studies that involve inhalation, which is our relevant exposure pathway in this case, are of course preferred over studies that assess other exposure routes. Studies of longer exposure durations and multiple exposure levels are also preferred, because they provide greater statistical confidence in the results.

In human epidemiological studies, problems include the fact that diesel effects have been notoriously difficult to quantify due to the complex composition of diesel particulates. Thus, in many of these studies, we are left with relying upon quantification of exposure by job classification and the number of years in that job, as well as industrial hygiene measurements made to represent each level in the job exposure matrix. In other words, a lot of assumptions are made when numeric results are extrapolated from these studies, which automatically injects uncertainty into the process. Typically, elemental carbon has been used as a surrogate for diesel, as well as a particle size of PM 2.5 (which refers to a particulate matter diameter of 2.5 microns). Using these parameters, what is actually being assessed is respirable elemental carbon: in other words, elemental carbon particles that are small enough to be drawn deeply into the lungs. Although these studies use elemental carbon with a particle size of PM 2.5 to serve as a surrogate for diesel, Lambert emphasized that no single constituent is recognized as a unique marker for diesel.

In regard to documented exposures of workers to diesel particulates, the exposure ranges associated with each worker group type is important to consider. Lambert used a slide to present average exposure concentration for each type of worker group: 5 ug/m3 for long-haul truckers, 50 ug/m3 for railroad workers, 100 ug/m3 for underground mine workers, and 10 ug/m3 for dock workers. The average ambient U.S. urban average ambient air exposure concentration is 1.0 ug/m3. The estimated concentration for workers exposed to new-technology diesel engines is 0.1 ug/m3. The studies upon which these values are based were conducted from the 1970s to the 1990s.

These exposures would essentially be integrated across work shift durations rather than over a lifetime, and be discussed in terms of occurring over a *working* lifetime. Note that that the urban ambient air data is from 1994, and was obtained from USEPA. It is expected that present-day urban ambient air concentrations of diesel would be much less than that measured in 1994.

All of the studies available to us, and upon which an ABC for diesel can be based, are related to old-technology diesel engine (pre-2008) emissions. The health endpoint in all cases is lung cancer. The three worker groups that have been assessed are truckers, railroad workers, and underground miners. There are multiple studies on trucker exposure, and the estimates from these studies converge. So, the risk estimates are fairly consistent and tightly-grouped. The most recent analysis by Garshick, et al. was published in 2012, and pools the findings of several earlier studies. The nice thing about this study is that it accounts for the “healthy worker effect” bias, which was unaccounted for in earlier studies. The healthy worker effect refers to the idea that someone who is healthy enough to work may be a bit less vulnerable to disease conditions than someone out of the general population. So this study used time-to-event analysis and time-to-lung-cancer analysis, and then corrected for duration of work exposure. This protocol resulted in the correction of a negative compounding effect, and so the risk estimates actually increased for lung cancer, as compared to the original studies upon which Garshick’s meta-analysis is based. Thus, we believe that risk estimates from the earlier studies weren’t as high as they should have been.

Railroad worker studies also have this problem of negative compounding, so these data are currently being re-analyzed by NIOSH (National Institute of Occupational Safety and Health) but are not yet available. The most useful study for the committee to use would be a study done conducted jointly by NIOSH and the National Cancer Institute, which is the Diesel Exhaust in Miners Study (also referred to as DEMS) on underground miners, but this information is also not yet available. So currently the data that Lambert will discuss will be focused on the trucker studies.

The Garshick trucker study provides mortality ratios. The study assessed two groups: a worker cohort which included workers of age 40 and above (including 2,000 mechanics), and a second group which did not include the mechanics. More than 30,000 workers are represented in this national data set. The exposure measurements were made at various locations around the United States, including a location here in Portland.

In terms of units of micrograms per cubic meter-months, 122 lung cancer deaths were observed for workers that were exposed at the lowest level of less than 371 ug/m3-months. The number of cancer deaths was the same whether the mechanics were included or not. Therefore, 371 ug/m3-months will be considered the reference level, or the lowest level of exposure, and can be thought of as being ambient background. The next level of exposure at 371 to 860 ug/m3-months showed an increase in the number of deaths: 193 in the group with mechanics, and 191 in the group without mechanics. This change from 122 to 193 is equivalent to a ratio of a 30% increase, which is equal to a hazard ratio of 1.3. So that's a 30% increase in cancer deaths at the higher concentration, which is statistically significant. This trend continues as the exposure concentrations increase.

However, the overall trend when we consider all four levels of exposure in these studies is not statistically significant. It has a P value of 0.4, whereas a statistically significant result is interpreted to be present at a P value of 0.05 or lower. However, that being said, we still see the estimated risk increasing as the exposure concentrations increase. This study really represents the most closely controlled and most accurate analytic study that we have available to us right now.

The risk estimates also agree well with the estimates by Kyle Steenland published in 1995, and there's actually great consistency in the literature. The five-year lag is important to consider in these studies, as it take 5 to 15 years after exposure to a carcinogen for the cancer to actually appear. In addition, there are individuals who might be very susceptible and develop cancer rapidly, while other individuals might not manifest a cancer effect until a greater amount of time has passed. By building in a five-year lag time, you allow time for the process of pathogenesis to occur. Thus we are looking at exposures that occurred at least five years prior to a diagnosis of lung cancer.

Bill Lambert then referred to his ninth slide, which showed that elemental carbon is used as a marker of diesel exhaust in the diesel trucking terminal study and paper by Sheesley 2009, and Garshick and others. He noted that both Bruce Hope and Sue MacMillan had already alluded to the use of elemental carbon as a surrogate for diesel exhaust. In the Sheesly study, they used the OCEC (organic carbon/elemental carbon) method and then also the gas chromatogram/mass spectrometer method for comparison. The bar graph shown in the slide indicates the worker groups that are exposed to operating diesel engines. Unsurprisingly, the vast majority of elemental carbon was attributed to diesel exhaust, but they were able to tease out the effects of exposure to cigarette smoke, which is represented by a diagonal crosshatch in each bar. Exhaust related to lube oil is represented in each bar by vertical stripes, while a catch-all category of unapportioned elemental carbon is also accounted for.

But in the study by Sheesley (2009), most of the exposure to elemental carbon at one terminal in Saint Louis was believed to be associated with diesel exhaust. There are very few studies like this that are available to us. The studies are more anecdotal than quantitative, but they give us some confidence in the measures used for the epidemiologic study. However, these studies wouldn't necessarily be useful for deciding how to monitor diesel, as Hope pointed out earlier.

The 2014 study by Vermeulen is a meta-analysis (Lambert's tenth slide), which indicates that it's an analysis of multiple earlier studies, or a study of studies. It is quite a good one, and it looks at studies done by Garshick, Steenland, and Silverman. The graph presented in the slide showed the groupings of the relative risks of lung cancer from all of these studies, based on exposure to elemental carbon.

The graphs in slides 10 through 12 look at the number of cancer deaths that occur in a population of 1,000 workers, while DEQ and the ATSAC must consider how many excess cancer deaths occur in a population of 1,00,000 people. So the values from this study need to be considered in the light of this difference.

New studies are underway , but Bill Lambert guessed that the results of good epidemiologic research on lung cancer caused by diesel is probably 10 years away, including studies conducted on the new-technology diesel engines. Studies on the worker populations in the U.S. and China will likely provide some valuable information in the future. In addition, future more-sophisticated studies will likely focus on particulates with a diameter smaller than 2.5 microns – that is, ultrafine particles with a diameter of less than 1 micron, and smaller. As mentioned earlier, at this point in time, we don't know if it's the mass of the particles or total number of particles that is most relevant to health effects.

In spite of the fact that a larger number of new-technology diesel engines will be in use in the future, with a concurrent significantly lesser risk, old-technology diesel engineers are still in use throughout Oregon, and the health impacts caused by these older engines are what we need to protect the public against currently.

Bruce Hope had a question about how urban background (as shown in Bill Lambert's slide 9) was defined, assuming elemental carbon was used as a marker for diesel. Lambert explained that urban background concentrations were determined as a far-field measurement outside of the freight terminal. It was meant to be offered as validation of the fact that the Garshick study used respirable elemental carbon as the compound to which the workers were exposed.

Bill Lambert stated that he still has not found any literature supportive of the diesel exhaust unit risk estimate published by the OEHHA in 1998. Bruce Hope stated that he has been unable to find another regulatory agency that's even attempted to replicate OEHHA's work, much less try to generate a quantitative value. Bill Lambert concurred, and said that there's no new information available, at least not from a regulatory agency.

In regard to the Vermeulen study, David Farrer asked how relative risk values are related to unit risk estimates. In the studies used by Vermeulen in his meta-analysis, the relative risk estimate is the additional risk expressed essentially as a percentage. So a relative risk of 1.3 would be a 30 percent increase in excess deaths due to lung cancer. Relative risk is different from a unit risk estimate.

To obtain a risk estimate, Bruce Hope pointed out that a slope factor has to be generated first, and it does not appear than the committee can obtain a slope factor from this data. You can extrapolate a risk estimate from information in the Vermeulen paper, however. The value you get might not be appropriate for us to use, but you can calculate a value.

Bill Lambert noted that these studies focus their assessment on the number of lung cancer deaths, rather than the number of cancer incidents, which is probably a less-sensitive parameter than the number of cancer incidents. However, in terms of epidemiologic research on lung cancer, deaths from is lung cancer is a fairly unambiguous outcome which is well characterized, and usually pretty accurately. There is some error in regard to cause of death listed on death certificates, certainly, but that error is believed to be small relative to the effect that we're seeing. Based on Bill Lambert's point of view, he strongly recommends that the committee use only human data for diesel effects, as the rodent model is not sufficiently similar to what happens to humans exposed to diesel.

After a 10-minute break, Bill Lambert reminded the committee that they are charged with developing health-based benchmark concentrations for chemical compounds that present a hazard to Oregonians. Sometimes, the ABCs that the committee recommends to the DEQ are technology-forcing or policy-forcing, as we do our best to evaluate the relevant health information and make a recommendation that is technically workable. It's not our charge to worry about policy or cost, and in some cases it may not even be appropriate for us to consider technologic feasibility as it relates to things. But we do want to generate a benchmark concentration that has utility and works well for the protection of health. And so please keep that in mind as we discuss things here. At this point it would be appropriate for us to talk about what we feel can be recommended as an indicator of diesel exhaust, and the technical pros and cons of selecting that indicator.

Bruce Hope responded that he agreed with use of the elemental carbon (typically referred to as EC) component as a marker, because he believes the evidence supports the idea that diesel is not the only toxic component in particulate matter, but other combustion sources also contribute. He thinks EC can be measured in a reliable and repeatable way, or at the very least a method can be used that most users can agree with. But he emphasized that PAHs need to be measured simultaneously, because we need to determine whether EC itself produces its own health impacts, with or without PAHs being present. Diesel and internal combustion processes adhere PAHs to the EC particle as well, but the mechanism is not clearly understood. We need to measure and assess not only the particles, but also those chemicals or molecules adsorbed to those particles.

Bruce Hope suggested measuring EC as unambiguously as possible, and identifying a protective level. He emphasized the need to partner that approach with PAH health-protective levels. He predicts that as our society moves forward with greater and greater control of diesel emissions, that the amount of EC in the air will also decrease, and the problem will be solved. But he asked what if EC does not decrease under these circumstances? If this happens, then we won't be protecting people's health by simply trying to control diesel, and we don't want to miss recognizing this problem if it occurs in the future. That is why Hope is arguing for EC as a universal measure of a health effect associated with inhalation of particles, whether the EC originated from diesel emissions or not. All these considerations point to the idea that we should simultaneously monitor EC, diesel particulate matter, black carbon, and PAHs should be monitored simultaneously, rather than just monitoring EC by itself.

Bill Lambert asked a former DEQ air quality staff member in the audience, Gregg Lande, what his opinion was. Lande said his preferred approach would be to use a specific measurement technique that would identification of where the emissions were coming from, using source fingerprinting protocols. Lande said that EPA has a database called SPECIATE, where they have information on particulates originating from each sector and/or category.

Bill Lambert asked Anthony Barnack, DEQ, if he had consulted with his laboratory staff about the methods used. Max Hueftle stated that Jerry Boyum, the head of the LRAPA monitoring section, hadn't had much experience with this method or with the use of aethalometers, which is what DEQ is using now. He suggested that Dr. Chow at the Desert

Research Institute, or other staff there, have done some work on the IMPROVE- Total Optic Resonance (IMPROVE-TOR) method, which Boyum believes is more widely used that the NIOSH method.

Bill Lambert said that for the eventual application, we would make measurements and use the apportionment method to come up with a level related to diesel EC. This approach would be useful for air quality planning and management. Even though the method requires adjustment and the results have some uncertainty associated with them, an investment could be made in this area in order to address diesel as a concern for health. The measurements would be made and we would be estimating the contribution from diesel in that area. Other modeling approaches are probably available and in use, as well. Bill Lambert mentioned that Bruce Hope had said earlier that prior knowledge of a specific type of source of EC in the area could lead to incorrect interpretation of results, but Bill Lambert feels that this type of limitation will always be present, to some degree.

Bruce Hope explained that, yes, he feels that the use of prior knowledge of the type of source that's present in an area where air is being monitored for EC, can be used incorrectly to identify the emissions as having come from diesel engines, when in fact it may have come from a mix of sources, some of which may not be easily identifiable or obvious. It's dangerous to make the assumption that if diesel sources are present in an area, then all EC emissions monitored in the area must come from diesel sources. In many cases, assuming that monitored EC comes from diesel is probably fairly accurate, but Hope is uncomfortable with not being able to make a more solid case for where EC originates. To say it another way, if we collect EC from near a loading dock, or a train yard, or a mine, chances are the EC we've collected can be attributed to one of these sources. But if EC is collected somewhere else and no obvious sources are present nearby, then you can't be sure where the EC has come from. Thus, Bruce Hope wants the measurement to be as clear and unprejudiced as possible, without having any prior knowledge of where the EC might have originated. He emphasized that we need to know what level of EC we're dealing with, whether we can tie it to a specific source or not, so that we can correlated the amount of EC to health effects. Thus, he agrees that EC should be measured, but let's be able to come up with a toxicological basis for a protective level of EC, associated with unambiguous measurement of that EC.

Bill Lambert offered that EC originating from diesel emissions can be estimated from an environmental measurement of EC. Basically, EC may or may not be diesel, but diesel is always EC. Hope agreed. Lambert then said that, therefore, EC measurements can form the upper-bound estimate of how much diesel is present. But he also pointed out that BC measurements are less expensive and more reliable than EC measurements.

Bruce Hope asked if BC measurements can be tied to a dose-response relationship, and thus to a specific health outcome. Bill Lambert said no. Bruce Hope said that that's the point: for whatever reason, the bulk of the available literature on this topic chose EC to represent diesel, not BC. Bruce Hope then asked Bill Lambert if he would consider using black carbon as a surrogate for EC, and Bill Lambert responded affirmatively.

Bill Lambert observed that the use of EC as a surrogate for diesel is useful to us right now with the current mix of diesel engines, but the situation might not be the same 10 years from now. We have to work with conditions as they are today. Bruce Hope agreed, and said that if EC concentrations decrease as traditional diesel engines are gradually replaced with new technology diesel engines, then use of EC as a marker for diesel will be supportable. But in the future, if EC ends up being a health problem aside from any relationship to diesel, then we must be ready to recognize this and deal with it appropriately.

Bill Lambert suggested that we could recommend a nuanced ABC for diesel particulate matter which could state that diesel particulate matter is known to cause adverse health effects, while leaving the current benchmark in place or revising it. He said that we could also specify that there are reasonable surrogates, such as EC or even BC that could be used as markers for diesel particulate matter, until better, more developed options become available.

Bruce Hope said that the Oregon rule language as it currently stands only refers to diesel particulate matter as the chemical of concern. He thinks the rule language could be changed to include assessment of diesel particulate matter as measured according to the use of EC as a marker, and assign an ABC to it. Lambert asked the rhetorical question of whether we want to measure diesel particulate matter as its own entity, which would be yes. Then he asked which marker the committee wants to use to represent diesel particulate matter.

One committee member recommended that the committee differentiate between "uncontrolled diesel" and "diesel exhaust". This suggestion is related to the fact that we already know that new technology diesel engines are contributing far less emissions that the traditional diesel engines, and over the next 10 years or so the traditional diesel engines are likely to be phased out through attrition. The two types of engine technology have completely different chemical signatures in terms of air emissions. In addition, if we decide to recommend that DEQ monitor for EC rather than diesel particulate matter, but all related modeling is still focused on diesel particulate matter, then it will be very difficult to make apple-to-apple comparisons of air data and to use it appropriately in the models, which were built around assessing diesel particulate matter. However, another committee member didn't think that adjusting modeling assumptions to address using EC to represent diesel particulate matter would be difficult to do.

Bill Lambert pointed out that these issues of modeling and monitoring are more DEQ's concern than the committee's, but that our discussions today reflect the ATSAC's technology-forcing and policy-forcing role in regard to certain ABCs. As the committee considers the health basis for the recommended ABC, we can make some suggestions that could be taken into consideration by DEQ per guidance or the actual execution of identifying air emissions.

Also, the committee needs to consider what type of surrogate we might want to use to represent diesel exhaust. We need to better define diesel particulate matter, especially in light of the fact that our information has become more sophisticated and has matured over the past 10 years. In addition, we could choose to use EC to assess the toxicity and health effects related to diesel exhaust, as EC is more directly tied to the health effect information that is available.

Bruce Hope agreed that EC is an appropriate surrogate for diesel particulate matter. He said that many groups who are looking at this issue start out by assessing the toxicity of diesel particulate matter, but end up looking at EC, because otherwise they wouldn't be able to come to a conclusion. Similar to the approach taken by California in 1998, we about the use of total particle mass to be representative of whole diesel exhaust. Now, 10 years later, we can focus on the use of EC as a surrogate because we have more and better information, and more-precise definitions. We need to develop a rationale and gather evidence that supports the use of EC, rather than diesel particulate matter, to assess diesel exhaust. We can also review what other agencies have done, and assess the strengths and weaknesses of the various approaches.

David Farrer said that he also leans toward the use of EC as a surrogate for diesel particulate matter, and suggested that conversation be limited to the usability of EC.

Bill Lambert recommended to the committee that it should develop the evidence behind the use of EC and diesel particulate matter prior to the next ATSAC meeting in July. Bill Lambert tends to support the use of EC as a marker for diesel, and so would suggest that we move away from the diesel particulate matter definition that we used 10 years ago. But if this is the way the committee will choose to go, then the committee needs to review and document the evidence for whatever approach is chosen. In line with this, Bill Lambert also suggested that committee systematically review the information from all of the agencies and organizations that have considered regulation of diesel, along with systematic review of the strengths and weaknesses of each of their approaches. Ten years ago, our information was not as developed, but we knew that diesel particulate matter was a health concern that needed to be addressed, and so we chose an ABC at that time that seemed appropriate.

For the next ATSAC meeting in July, Bruce Hope offered to provide the committee with a regulatory history of diesel particulate matter, including how different agencies have looked at diesel. Bill Lambert pointed out that the committee would need to have Bruce Hope's presentation materials in advance of the meeting, to be able to review it and then be read to propose standards for consideration at the July meeting. Related to this pre-meeting work, the committee will wait to hear back from Sue MacMillan, DEQ, about how much leeway the committee has in regard to talking about technical issues between meetings. Max Hueftle agreed to assist Bill Lambert in summarizing the metrics of EC versus DPM. Kent Norville will work with Phil Allen, DEQ, to describe the use of ABCs in modeling programs. Sue MacMillan agreed to find Bruce Hope's old slides that describe what the previous ATSAC used to make their earlier ABC decision for diesel particulate matter.

Dean Atkinson also supports the use of EC as a surrogate for diesel particulate matter. He thinks discussions during the previous ATSAC tenure were captured in a PowerPoint presentation. Ten years ago, the technical community was talking about diesel particulate matter in a very general way, and weren't too clear about what they actually meant. Our current information on EC is a lot better than what was previously available, and Dean Atkinson does think that EC has the most solid connection quantitatively to health outcomes. He pointed out that EC measurements form the upper bound of diesel exhaust measurements, and that not all EC is diesel exhaust, but all diesel exhaust is EC. In addition, BC measurements could also be used to identify the upper bound of diesel exhaust measurements.

Bill Lambert stated that the planning for the next ATSAC meeting in July was complete. He asked if there was any additional business the committee wanted to discuss. Hearing none, he opened up the floor to audience questions.

## Comments and questions from audience

Mary Peveto introduced herself as the President and Co-Founder of Neighbors for Clean Air. Based on comments that Hope and Lambert had made during the diesel discussion indicating that they felt the DEQ had done a good job of controlling diesel emissions, Peveto heartily disagreed. Hope emphasized that he had stated his own personal opinion, only.

Mary Peveto acknowledged that the ATSAC took a leadership role 10 years in regard to air toxics, and were pioneers in that respect. Nonetheless, she did not like that the ATSAC had decided to disregard animal studies in decisions on the ABCs, or that sometimes ABCs are chosen simply because there is a lack of other available toxicity data. She stated that animal studies have been used to make decisions about diesel in neighboring state, and were important in eliminating diesel emissions.

She then wanted to know that if the ATSAC is dismissing animal studies, then does that decision compromise all other ABCs which were set based animal studies? In fact, in regard to diesel, she mentioned a previous deliberation that there is a need to rely on animal studies when no human epidemiology studies are available. She interpreted the previous diesel conversation to mean that the ATSAC is waiting on human exposure studies based on the new diesel engine technologies, when the ATSAC should be making decisions based on what is present in air currently, regardless of the technology that is or will be available.

Bill Lambert responded that in regard to animal studies, the ATSAC clearly sees the value of animal studies when there's an appropriate model for a variety of other chemical hazards and air toxics; so the use of animal studies for compounds other than diesel is not being questioned by the ATSAC. Rather, it's the questionable applicability of animal studies in the particular case of diesel. Rodent inhalation test models, in this case, are not appropriate to use for judging the toxicity of diesel exhaust to humans for a variety of technical reasons.

In regard to the question about the ATSAC waiting on new studies, Bill Lambert pointed out that the ATSAC committee is on a schedule of re-evaluating new evidence that comes forward, every five years. Thus, should new evidence become available for diesel toxicity, this committee would be consulted by the DEQ and the committee would convene and consider that information at the time it becomes available. But for diesel, the ATSAC is working with what is available currently, and it is based on the old diesel engine technology, which produces the high levels of diesel in air that we're concerned with. It is the ATSAC's intention to create an ABC that is based on the available evidence, but we know in the coming years that the new technology will result in lower levels of diesel in the air. It is likely that new studies, based on emissions from the new diesel engine technology, will also become available in the future. At that time the ATSAC would need to re-visit whether the ABC is still relevant to diesel emissions present at that time.

John Krallman, the Staff Attorney from Neighbors for Clean Air, introduced himself. He made a number of points:

- In regard to the value obtained from the Vermeulen paper: 0.8 ug/m3 resulted in 21 deaths per 10,000, according to Lambert's slides. This results in about 200 deaths per million people, which is two orders of magnitude too high.
- Diesel is <u>the</u> air toxics problem in our state. Instead of dealing with chemicals in diesel, look at what our neighbors are actually getting exposed to.
- Persistence, bioaccumulation, multiple exposure, too limited an approach. In making decisions about diesel particulate matter, Krallman strongly urged the committee to focus on the health risks first, and only then worry about how to measure it and model it.

John Krallman thought it was interesting that, in looking at one of Bill Lambert's slides, it indicated that the Vermeulen paper exposure level of 0.8 micrograms per cubic meter resulted in 21 deaths per 10,000 from lung cancer. If you do a back-of-the-envelope calculations from this, you get approximately 200 per million excess cancer deaths, which is two orders of magnitude greater than the acceptable level of 1 per million, which actually correlates with a protective standard that's two orders of magnitude less, which is close to the values that California and Washington use in their evaluations.

Mary Peveto pointed out a difference in policy, compared to how PATS and the Portland Air Toxics Solution modeled risk, which identified 25% on-road, 25% off-road, 25% wood smoke, 25% sort of miscellaneous just generally speaking. It appears that California and Washington have a clear approach to dealing with diesel particulate matter, while Oregon appears to have a much more muddled picture of diesel particulate matter. This means that Oregon tries to do a little bit of everything, rather than targeting what our neighbors believe is the biggest problem.

She stated that this committee is supposed to evaluate the adequacy of the benchmarks, and the adequacy of meeting human risk and health levels considering sensitive populations, scientific uncertainty, persistence, bioaccumulation and to the extent possible multiple exposure pathways. She thinks this seems like a limited scope of evaluation. The committee talked about how diesel particulate matter can't really be directly monitoried, and using EC as a surrogate might be a good suggestion. But she thinks, that in setting an acceptable level of diesel particulate matter as a benchmark, those sorts of questions should be dealt with after the health analysis is performed. Out of the health analysis you pick an acceptable level; then you figure out how to monitor it to determine whether or not progress is being made, maybe through modeling and monitoring protocols.

Kevin Downing, DEQ, noted that elemental carbon may very well be the marker for the toxics discussed in the literature that are associated with diesel particulate matter, he challenged the committee to make sure it's confident that EC is, in fact, the appropriate marker. Also, Kevin Downing pointed out that the committee tends to mumble during discussions, and it's very hard for the audience to hear them – and this made what the committee said about policy- and technology- forcing implications hard to hear. He noted that DEQ has gone a little farther with particulate matter, and tried to identify sources. DEQ can monitor EC and determine it to be above or below an assigned ABC, but it would take some time for DEQ to identify sources of EC via a modeling approach.

Kevin Downing rebutted Bruce Hope's statement that DEQ is controlling diesel emissions well. Kevin Downing's information indicates a reduction of only about 1 percent overall. Therefore, determining an ABC for diesel is extremely important in terms of being able to measure our success/failure rate, and then to be able to communicate those results clearly. The ATSAC is charged with making a scientifically credible decision in regard to an ABC for diesel particulate matter, and other related concerns should not be the committee's focus. Information for EC has gotten better and is still developing, but Kevin Downing urged the committee not to abandon the diesel particulate matter ABC. He explained that DEQ needs an ABC for diesel particulate matter in order to be able to make ongoing decisions about the related actions that DEQ will take to control these emissions. Right now, DEQ has no way to accurately model EC coming from sources, and it would take DEQ some time to understand exactly where the sources of EC emissions might be located.

DEQ has determined that, based on the current ABC and on expected vehicle turnover, that Oregon would need to have reduced about 1,400 tons of diesel particulate in the interval between 2007 and 2017 to get down to even the current ABC for diesel. Over the last 14 years or so, Kevin Downing has been successful in reducing about 1% of that amount. So a credible ABC for diesel particulate matter does make a difference in terms of DEQ's ability to communicate clearly about th impacts associated with exposure to diesel engine exhaust. In fact, there is tremendous inertia by industry to keep things as they are and to continue to operate diesel vehicles and equipment without making any substantial investments at reducing emissions from those engines, because the costs of doing that are high. The committee must identify a benchmark that can be used to clearly support actions by fleet owners that will push past the inertia, and shouldn't be worrying about what the ultimate (future) implications may be.

Kevin Downing again strongly urged the committee not to abandon consideration of a revised ABC for diesel particulate matter, due to the lag time related to the Department's ability to actually effectively respond and identify control measures or even sources of emissions going forward.

Bill Lambert thanked Kevin Downing for his good advice, and for reminding the committee of several important points in regard to diesel emissions control. Bill Lambert said, in regard to Kevin Downing's last point, both he (Bill Lambert) and Max Hueftle will be carefully evaluating this EC-versus-diesel-particulate-matter issue, which will be discussed at the next meeting. It should be noted that there is some literature that suggests that simple mechanical overload by particulate matter of the lungs, which can occur long before any cancer effects appear.

Kevin Downing added that the use of older engines in Oregon is a very difficult thing to track. DEQ requires contractors to provide information about the vehicles being used, including the vehicle identification number and the engine family name so that the age and model year of the engines in the vehicle can be precisely identified. In one case, I had to go out in the field to actually open the hood of a vehicle and look under the engine, because the information provided to DEQ seems a little off. It turned out that the vehicle itself -- dump truck in this case -- was built in 1995. That was the model year of the chassis but they called a glider kit. So they built trucks without engines and in this case the engine that they put in the vehicle was from 1983, so it predated the earliest of EPA's regulations from 1988. This kind of problem occurs in cases where people own trucks of a certain vintage, but have outfitted them with very much older engines. Kevin Downing said that we face these and other issues around the assessment of emissions from diesel engines in fleets in Oregon.

## Meeting Adjournment

Bill Lambert adjourned the meeting at noon, and reminded everyone that the next ATSAC meeting is scheduled for Wednesday, July 15, 2015, from 9 am to noon PDT in this same location.