



BAY AREA  
AIR QUALITY  
MANAGEMENT  
DISTRICT



## ADVISORY COUNCIL REGULAR MEETING JOINT MEETING OF THE TECHNICAL AND AIR QUALITY PLANNING COMMITTEES

### COMMITTEE MEMBERS

#### AIR QUALITY PLANNING COMMITTEE

JOHN HOLTZLCAW, PH.D, CHAIRPERSON  
HAROLD BRAZIL  
IRVIN DAWID  
EMILY DRENNEN  
FRED GLUECK  
KRAIG KURUCZ  
KEVIN SHANAHAN

#### TECHNICAL COMMITTEE

STAN HAYES, CHAIRPERSON  
SAM ALTSHULER, P.E.  
DIANE BAILEY  
LOUISE BEDSWORTH, PH.D  
ROBERT BORNSTEIN, PH.D.  
WILLIAM HANNA  
JOHN HOLTZCLAW, PH.D.  
NORMAN A. LAPERA

WEDNESDAY  
JUNE 8, 2005

7<sup>TH</sup> FLOOR BOARD ROOM  
9:30 A.M.

1. **Call to Order – Roll Call**
2. **Public Comment Period**

*Public Comment on Non-Agenda Items, Pursuant to Government Code Section 54954.3. The public has the opportunity to speak on any agenda item. All agendas for Committee meetings are posted at the District, 939 Ellis Street, San Francisco, at least 72 hours before a meeting. At the beginning of the meeting, an opportunity is also provided for the public to speak on any subject within the Committee's purview. Speakers are limited to five minutes each.*

3. **Approval of Minutes**

(A) Air Quality Planning Committee - April 4, 2005

(B) Technical Committee – April 13, 2005

**4. Continuing Review of Climate Change**

*The Committees will receive and discuss a staff presentation on climate change that includes a report on the May 20 Board of Directors Executive Committee discussion of climate change and potential District climate change activities.*

**5. Community Air Risk Evaluation (CARE) Program**

*The Committee will receive and discuss a staff presentation on the CARE program.*

**6. Hydrogen Highway Blueprint**

*The Committee will receive and discuss a staff presentation on the District's discussions with Cal-EPA on the state Hydrogen Highway Blueprint.*

**7. Committee Member Comments/Other Business**

*Committee members, or staff, on their own initiative, or in response to questions posed by the public, may ask a question for clarification, make a brief announcement or report on his or her own activities, provide a reference to staff regarding factual information, request staff to report back at a subsequent meeting on any matter or take action to direct staff to place a matter of business on a future agenda.*

**8. Time and Place of Next Meeting**

*At the call of the Chair.*

**7. Adjournment**

**CONTACT CLERK OF THE BOARDS - 939 ELLIS STREET SF, CA 94109**

**(415) 749-4965**  
**FAX: (415) 928-8560**  
**BAAQMD homepage:**  
[www.baaqmd.gov](http://www.baaqmd.gov)

- To submit written comments on an agenda item in advance of the meeting.
- To request, in advance of the meeting, to be placed on the list to testify on an agenda item.
- To request special accommodations for those persons with disabilities notification to the Clerk's Office should be given in a timely manner, so that arrangements can be made accordingly.

JH:jc

**BAY AREA AIR QUALITY MANAGEMENT DISTRICT  
939 ELLIS STREET, SAN FRANCISCO, CALIFORNIA 94109  
(415) 771-6000**

**CLERK OF THE BOARDS OFFICE:  
MONTHLY CALENDAR OF DISTRICT MEETINGS**

**MAY 2005**

<u>TYPE OF MEETING</u>	<u>DAY</u>	<u>DATE</u>	<u>TIME</u>	<u>ROOM</u>
<b>Board of Directors Budget &amp; Finance Committee</b> ( <i>Meets 4<sup>th</sup> Wednesday each Month</i> ) - CANCELLED	Wednesday	25	9:45 a.m.	4 <sup>th</sup> Floor Conf. Room

<b>Joint Policy Committee</b>	Friday	27	10:00 a.m. – Noon	BAAQMD - Board Room 939 Ellis Street San Francisco, CA 94109
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**JUNE 2005**

<u>TYPE OF MEETING</u>	<u>DAY</u>	<u>DATE</u>	<u>TIME</u>	<u>ROOM</u>
<b>Board of Directors Regular Meeting</b> ( <i>Meets 1<sup>st</sup> &amp; 3<sup>rd</sup> Wednesday of each Month</i> )	Wednesday	1	9:45 a.m.	Board Room
<b>Board of Directors Regular Meeting on the Proposed FY 2005/2006 Budget</b>	Wednesday	1	Immediately following Board Regular Meeting	Board Room
<b>Board of Directors Legislative Committee</b> ( <i>At the Call of the Chair</i> )	Monday	6	9:30 a.m.	4 <sup>th</sup> Floor Conf. Room
<b>Advisory Council Joint Air Quality Planning &amp; Technical Committee</b>	Wednesday	8	9:30 a.m.	Board Room
<b>Board of Directors Mobile Source Committee</b> ( <i>Meets 2<sup>nd</sup> Thursday of each Month</i> ) - CANCELLED	Thursday	9	9:30 a.m.	4 <sup>th</sup> Floor Conf. Room

<b>Advisory Council Public Health Committee</b>	Monday	13	1:30 p.m.	Room 716
<b>Board of Directors Regular Meeting</b> ( <i>Meets 1<sup>st</sup> &amp; 3<sup>rd</sup> Wednesday of each Month</i> )	Wednesday	15	9:45 a.m.	Board Room
<b>Board of Directors Budget &amp; Finance Committee</b> ( <i>Meets 4<sup>th</sup> Wednesday each Month</i> )	Thursday	16	9:45 a.m.	4 <sup>th</sup> Floor Conf. Room
<b>Joint Policy Committee</b>	Friday	17	10:00 a.m. – Noon	MetroCenter Auditorium 101 8th Street Oakland, CA 94607

<b>Advisory Council Public Health Committee</b> - RESCHEDULED TO 6/13/05	Monday	20	1:30 p.m.	Room 716
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**June 2005 Calendar continued on next page**

## JUNE 2005

<u>TYPE OF MEETING</u>	<u>DAY</u>	<u>DATE</u>	<u>TIME</u>	<u>ROOM</u>
<b>Air District's 50<sup>th</sup> Anniversary Symposium</b>	Monday	20	11:00 a.m. – 4:00 pm.	Yerba Buena Center For the Arts San Francisco, CA
<b>Board of Directors Budget &amp; Finance Committee</b> <i>(Meets 4th Wednesday each Month)</i>	Wednesday	22	9:45 a.m.	4th Floor Conf. Room
<b>Board of Directors Executive Committee</b> <i>(Meets at the call of the Chair)</i>	Wednesday	29	9:30	4 <sup>th</sup> Floor Conf. Room

## JULY 2005

<u>TYPE OF MEETING</u>	<u>DAY</u>	<u>DATE</u>	<u>TIME</u>	<u>ROOM</u>
<b>Board of Directors Regular Meeting</b> <i>(Meets 1<sup>st</sup> &amp; 3<sup>rd</sup> Wednesday of each Month)</i>	Wednesday	6	9:45 a.m.	Board Room
<b>Board of Directors Public Outreach Committee</b> <i>(Meets 4<sup>th</sup> Monday every other month)</i>	Monday	11	9:30 a.m.	4 <sup>th</sup> Floor Conf. Room
<b>Advisory Council Executive Committee</b>	Wednesday	13	9:00 a.m.	Room 716
<b>Advisory Council Regular Meeting</b>	Wednesday	13	10:00 a.m.	Board Room
<b>Board of Directors Mobile Source Committee</b> <i>(Meets 2<sup>nd</sup> Thursday each Month)</i>	Thursday	14	9:30 a.m.	4 <sup>th</sup> Floor Conf. Room
<b>Joint Policy Committee</b>	Friday	15	10:00 a.m. – Noon	MetroCenter Auditorium 101 8 <sup>th</sup> Street Oakland, CA 94607
<b>Board of Directors Regular Meeting</b> <i>(Meets 1<sup>st</sup> &amp; 3<sup>rd</sup> Wednesday of each Month)</i>	Wednesday	20	9:45 a.m.	Board Room
<b>Board of Directors Stationary Source Committee</b> <i>(Meets 4<sup>th</sup> Monday every other Month)</i>	Monday	25	9:30 a.m.	Board Room
<b>Board of Directors Budget &amp; Finance Committee</b> <i>(Meets 4<sup>th</sup> Wednesday each Month)</i>	Wednesday	27	9:45 a.m.	4 <sup>th</sup> Floor Conf. Room

MR:hl  
5/25/05 (10:45 a.m.)  
P/Library/Calendar/Moncal

Bay Area Air Quality Management District  
939 Ellis Street  
San Francisco, California 94109

**DRAFT MINUTES**

Air Quality Planning Committee Meeting  
1:00 p.m., Monday, April 4, 2005

- 1. Call to Order – Roll Call.** 1:10 a.m. Present: John Holtzclaw, Ph.D., Chairperson; Harold Brazil, Irvin Dawid, Emily Drennen, Fred Glueck, Kraig Kurucz, Kevin Shanahan.
- 2. Public Comment Period.** There were no public comments.
- 3. Approval of Minutes of February 9, 2005.** Mr. Brazil requested that he be listed as “Present.” Mr. Glueck moved approval of the minutes as corrected; seconded by Mr. Brazil; carried unanimously.
- 4. California Hydrogen Highway Blueprint.** Dr. Shannon Baxter-Clemmons, Special Advisor on Hydrogen and Renewables, California Environmental Protection Agency (Cal-EPA) stated that the draft Blueprint was officially released on March 30, 2005. The first presentation on the Blueprint was given to the National Hydrogen Association last week. This is the second such presentation.

The Blueprint’s inception can be traced to January 6, 2004 when California Governor Arnold Schwarzenegger declared that he intended to promote hydrogen power and a hydrogen highway, and environmental health and economic growth simultaneously. His Executive Order S-7-04 designated 21 interstate freeways in the state as the Hydrogen Highway Network (“H2 CA Net”). He asked Cal-EPA to be the lead agency in developing the Blueprint for its development and implementation. The Governor perceives this approach as having energy security benefits as well. To date, three hydrogen stations have been formally designated as part of the H2 CA Net. There are 16 hydrogen stations in the State, but the other 13 are not yet sufficiently accessible to the public to be declared part of the H2 CA Net.

For assistance and oversight in developing the Blueprint, Cal-EPA put together an advisory panel of over 200 individuals from interest and stakeholder groups, each participating on a voluntary basis. These were allocated among five topic teams that developed independent reports, detailing an approach to the topic and offering roll-out strategies, assessing the status of technology, how to site the stations throughout the state, assessing societal benefits, economic challenges, implementation issues with regard to standards, codes and risk assessment, and public education.

The draft Blueprint contains seven reports. Volume I concerns policy documentation. Volume II addresses technical issues. Together, these represent the consensus of the advisory panel and its recommendations to the Governor. Five independently produced topic team reports follow.

The goal of the H2 CA Net is to diversify the sources of transportation energy used and to provide environmental and economic benefits. A phased approach will make use of existing alternative fuels and emerging technologies to help develop hydrogen use and to bridge the gap between today’s alternative fuel technologies and hydrogen technologies of the future.

Its initial Phase I goal is to have 50-100 fueling stations throughout California, 2000 light-duty fuel cell vehicles (FCVs), 10 heavy-duty FCVs and five stationary or off-road applications. Phase II aims to establish 250 hydrogen fueling stations in a lower-usage mode, 10,000 light-duty FCVs, 100 heavy-duty FCVs, and 60 stationary and off-road vehicle applications. Phase III aims to double the number of light duty vehicles on the road to 20,000, achieve a number of at least 300 heavy-duty FCVs on the road as well as 400 stationary and off-road vehicle applications in operation.

Regarding station build up, the Blueprint contains an action plan and a biennial review process. The action plan is identified in Volume I and calls for the Governor to provide funding, while emphasizing public/private partnerships to build stations and procure vehicles. Societal benefit goals include increasing renewable energy sources and minimizing greenhouse gas emissions. Station build up will begin in urban centers and thereafter spread outward into California.

Cal-EPA and the Bush Administration differ on the station mix criteria. The former seek a diversity of hydrogen producing technologies whereas the latter emphasizes production from coal combustion processes. The advisory panel members agree that renewable energy sources for hydrogen production are to be emphasized, and note that renewable energy sources and hydrogen are reciprocally interconnected in a variety of ways. Also, the lowest cost option is not necessarily to be preferred, inasmuch as other technologies that will be available in the not-to-distant future will become increasingly important. Use of existing stations is highly emphasized along with the development of new ones. The advisory panel also recommends making maximum use of the existing natural gas infrastructure and believes that 50 stations can be established in California by the year 2010. Phase II plans for 250 hydrogen fueling stations which, in urban areas, could be accessible within 5 minutes. Bridging stations would be established between the Bay Area and Los Angeles.

The Blueprint calls for \$53.5 million in funding from the Governor over the next five years for this program. Cost-sharing schemes and incentives for FCVs have been discussed. A major challenge remains in finding ways to sustain the income needed to support the program beyond this time frame. The advisory panel believes that, if the vehicles can be manufactured the infrastructure can be created to meet the need, investment in infrastructure is manageable.

The conclusions concerning the CA H2 Net are as follows:

- The CA H2 Net is a broad initiative for diversifying transportation energy use and for providing environmental and economic benefits.
- The CA H2 Net should be implemented in Phases.
- CA H2 Net will continue to put California in a world class leadership position and position the State for the successful introduction of hydrogen technologies to meet transportation, power generation, and other energy demands in the future.
- The biennial review of the Blueprint will evaluate the pace with which introduction can occur.
- The State-led public-private partnership should begin work to implement the Action Plan.
- The State needs to initiate a funding source.

In response to questions from the Committee members, Dr. Baxter-Clemmons stated:

The auto manufacturers require no convincing that the fuel cell is the future of the vehicle market. One manufacturer forecasts a global approach to the fuel cell vehicle (FCV), in which the basic structure of the FCV would be the same in terms of the frame and fuel cell location, and only the external body would differ—being tailored to each country in which the FCV is sold. This will enable mass production in the largest possible scale and enhance FCV economic attraction. Auto manufacturers have declared they will build a certain number of FCVs, and there is an increasing demand for them in Japan, Germany, Singapore, etc. The incentives created in California will send a message—in particular, to Japan—and although such incentives will not significantly draw down the cost of the vehicle, they will nevertheless assist as mass production capability increases.

The Department of Energy does not believe there is a shortage of the platinum that will be the primary component of the fuel cell, and the amount of platinum needed for a fuel cell decreases exponentially over time as technology improves. Phase III of the Blueprint will establish a basis for broad commercialization, with 20,000 FCVs planned for operation. This is a small percentage of the 20 million cars now driven in California, and some observers believe it will be three decades before the benefits of the Blueprint become manifest. Nevertheless, if the approach to a hydrogen transportation system is not started now, it will never come to fruition.

The history of alternate fuel and electric vehicles has been variously assessed. Electric vehicles still have a rather limited range, and General Motors recently held a symbolic “funeral” for its electric vehicle. Although hydrogen power requires an additional step in which electricity is used to produce hydrogen, never before have all of the stakeholders—environmentalists, car and fuel companies, and government—agreed on a technology that represents the future. Challenges remain with respect to renewable energy sources that are used to make the hydrogen and whether to use these to support existing infrastructure, the power grid or other applications.

The extent to which funding can be obtained for the Blueprint, and how hydrogen could be taxed, requires further discussion. A revenue bond has been suggested. The free market impact must also be considered where prices vary per kilogram, depending on the source producing the hydrogen. Transportation costs also factor in, along with taxes and possible renewable fuel subsidy.

Hydrogen stations may be variously used for both stationary and mobile source power, depending on whether the fuel cell is low or high temperature through electrolysis. Hydrogen stations in the early years of the Blueprint will be “delivered hydrogen” and will diversify from that point on.

Air Districts can assist with public education about the Blueprint, both in terms of short- and long-term goals regarding environmental and economic benefits, program safety, the various phases of the approach, and related aspects. Advocacy of more hydrogen fuel stations in the local Air District jurisdiction would be important, particularly in collaborating with fuel companies, local, regional and state government, and fire department staff. The Bay Area AQMD could be a major player in the development of the H<sub>2</sub> CA Net, and Cal-EPA would welcome working with staff.

Dr. Baxter-Clemmons offered to provide further information to Mr. Shanahan regarding cost comparison of a therm of natural gas in a natural gas vehicle in comparison with the same therm of natural gas delivered down the H<sub>2</sub> CA Net in order to produce hydrogen, and get it to a hydrogen fueling station. References and diagrams can be found in the report issued on the Internet (cf. p. 14, Volume I).

The cost of using bio-gas for vehicles, which occurs in Sweden, is decreasing, but it is not at a point at which it is cost-competitive. The H2 CA Net does not want to abandon near-term options for alternative fuels and vehicles. The approach to FCV's is not exclusive, and the societal benefits will increase as 20,000 such cars are on the road by the year 2015. If society wants hydrogen fuel as the basis for its transportation, it will have to start now and plan for the long-term.

5. **Committee Member Comments/Other Business.** Mr. Dawid commended the minutes from February 9, 2005 meeting for their accuracy and detail, and inquired as to a possible referral from the Board of Directors to the Advisory Council on diesel emission at ports. Peter Hess, Deputy Air Pollution Control Officer, clarified for the Committee that this matter had been referred to another Committee of the Governing Board.
6. **Time and Place of Next Meeting.** 9:30 a.m., Wednesday, June 8, 2005, 939 Ellis Street, San Francisco, California 94109.
7. **Adjournment.** 2:20 p.m.

James N. Corazza  
Deputy Clerk of the Boards

:jc



Bay Area Air Quality Management District  
939 Ellis Street  
San Francisco, California 94109

**DRAFT MINUTES**

Advisory Council Technical Committee Meeting  
9:30 a.m., Monday, April 13, 2005

- 1. Call to Order – Roll Call.** Chairperson Hayes called the meeting to order at 9:32 a.m.  
Present: Stan Hayes, Chairperson, Sam Altshuler, P.E., William Hanna, Norman A. Lapera, Jr., Brian Zamora, Advisory Council Chair (ex officio). Absent: Diane Bailey, Louise Bedsworth, Ph.D., Bob Bornstein, Ph.D., John Holtzclaw, Ph.D.
- 2. Public Comment Period.** There were no public comments.
- 3. Approval of Minutes of February 7, 2005.** Mr. Altshuler requested that in line ten of paragraph one on page four, “heat” be inserted before “islands,” and he moved approval of the minutes as amended; seconded by Mr. Hanna; carried unanimously.
- 4. Update on the District’s Community Air Risk Evaluation (CARE) Program.** Janet Stromberg, CARE Program Manager, stated that the District will contract with Sonoma Technologies, Inc., to develop toxic air contaminant (TAC) emission inventory/emission density maps for the Bay Area. These will include an inventory of annual average TAC emissions from area, point- and on-road motor vehicle sources, and weight TAC emissions according to their toxicity. These maps should be completed within three months of the date the contract is signed. District staff is also receiving training in graphical interface system (GIS) mapping, in order to augment in-house capability.

The District is also working to better understand exposures to TACs through measurements and monitoring. It will also add two canister samplers in the neighborhood selected for a cumulative risk assessment pilot project and compare the data gathered with data from the broader emission monitoring network. The goal is to improve the ability to identify ambient diesel particulate (PM).

Attempts to improve the identification of diesel PM are underway. Chemical mass balance analyses show that most anthropogenic PM<sub>10</sub> and PM<sub>2.5</sub> derive from burning wood or fossil fuels. Geological dust, and tire and break wear are small contributors to PM<sub>10</sub> and PM<sub>2.5</sub>. Peak PM concentrations occur in winter due to meteorological conditions conducive to ammonium nitrate production and wood combustion. Carbonaceous PM accounts for about half of peak PM<sub>10</sub> and PM<sub>2.5</sub> and also annual PM<sub>2.5</sub>. Ammonium sulfate is a significant contributor to annual PM<sub>2.5</sub> but only a small contributor to peak concentrations of PM.

Carbon 14 analysis is being used to distinguish the amount of new and old carbon present in a PM sample. The results from 20 samples taken on five separate days suggest that PM from fossil fuel combustion is much lower than previously thought. New techniques developed by Desert Research Institute (DRI) and CalTech, which speciate hydrocarbons for hopanes and steranes, will be used to distinguish gasoline and diesel PM from other fossil fuel carbon. Certain polyaromatic hydrocarbons (PAHs) are found in greater quantities in gasoline PM than in diesel, while certain polar organics provide markers for wood burning and cooking. These will be identified in the speciation.

In reply to Committee member questions, Ms. Stromberg, Peter Hess, Deputy Air Pollution Control Officer, and Gary Kendall, Technical Division Director, made the following points:

- the CARE program will conduct a cumulative risk analysis for a pilot project neighborhood, and its Task Force will provide input for identifying criteria for a pilot neighborhood. These will be combined with the data from the TAC emission maps and a final selection will be made.
- the best available science will be used in assessing concentrations of diesel PM in ambient air. DRI is confident that new markers have been identified for diesel PM in its hydrocarbon speciation. Staff is in the process of discussing additional research projects with DRI.
- staff has tracked measurements obtained during wildfires to distinguish peak versus annual PM concentration. The field of measurement and analysis is expanding, and next week a major conference on this subject is taking place in San Francisco with many well-known experts. A focus on “nano-particulates” is developing in this field.
- the choice of a pilot neighborhood will include not only potential regulatory action that may be taken on a source to reduce TACs, but also creative approaches beyond regulation, and the availability of grant money will provide for the opportunity. The District will seek legislation to obtain additional regulatory authority. The recommendation on which neighborhood to select will be presented to the Council before a decision is made. It is anticipated that the decision could be made some time in the fall of this year.
- communication and public outreach will be a critical component of the CARE program.
- the staff report, distributed at each Committee member’s place, entitled “Sources of Bay Area Fine Particles: A Chemical Mass Balance Analysis,” dated April 2005, is preliminary. When it is near completion, staff will present it to the Council with a more detailed technical focus. Mr. Altshuler’s observations that lube oil has unique markers, and that referring to the coefficient of haze when a filter contains ammonium nitrate, are useful.

**5. Continuing Review of Climate Change Issues.** Committee Chair Hayes presented “Management of Greenhouse Gases: Recent Developments.” He noted that the greenhouse effect is one in which solar radiation passes through the clear atmosphere and is absorbed by the earth’s surface and warms it. Some of this infrared radiation is absorbed and re-emitted by the greenhouse gas molecules and the direct effect is the warming of the earth’s surface and the troposphere. A temperature plot going back 1,000 years—with estimates prior to 1902 based on tree rings and ice core sampling and instrumental data thereafter—shows significant temperature increases since the 1970s, and particularly since 2000. Thermometer readings from 1860 to 2000 confirm this trend.

Six greenhouse gases are the subject of the Kyoto protocol: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride, although not all of these are of equal potency as greenhouse gases (GHGs): the latter being 23,900 times as potent as the first. In 2000, 83% of emissions of GHGs in the US were carbon dioxide, with methane at 9%, nitrous oxide at 6% and hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride at 2%. For carbon dioxide, the energy industry contributes 35%, transportation 26%, manufacturing and construction 12%, commercial, institutional and residential 9%, agriculture 7%, industrial processes 4%, fugitives from fuel production 3% and waste 3%. More than 50% of GHGs in the US were emitted by the electric power production industry. From 1990 to 2000, there is a continual increase in carbon dioxide emissions from the commercial, residential, transportation and industrial sectors.

The Kyoto Protocol establishes binding limits for 38 developed countries to reduce GHGs from 2008 to 2012 by 5% relative to a baseline developed in 1990. To be valid, the Kyoto Protocol required ratification by 55 governments, within which the ratifying governments included developed countries representing at least 55% of that group's 1990 carbon dioxide emissions. This occurred when Russia ratified the Kyoto Protocol in November of last year. The Protocol took effect February 16, 2005, affecting 126 nations. Only four industrialized countries have not ratified the Kyoto Protocol. These are: Australia, Liechtenstein, Monaco and the United States.

The European Union (EU) thought the Kyoto Protocol would be approved and moved forward on its own. Now every one of 30,000 stationary sources in the EU must have an operating permit that limits GHG emissions. This covers about 45% of the carbon dioxide emissions in the EU. Penalties for non-compliance range from 40 to 100 euros per ton of carbon dioxide emitted. National allocation plans were established March 31, 2004 indicating how the reduction in GHG emissions would be allocated. During 2005-2007, 40 euros per tons will be assessed for violating the carbon dioxide emission allowance, and between 2008 and 2012 it will be 100 euros per ton.

In the United States, a Global Climate Change Initiative by the Bush Administration has selected to cut GHG "intensity" by 18% over the next 10 years. Improved GHG registry information is being sought, and will protect transferable GHG emissions reduction credits. Some voluntary initiatives for GHG emissions reporting and reduction include an internal trading program sponsored by BP Amoco and Shell; the Chicago Climate Exchange, with 14 founding members including American Electric Power, DuPont, Ford, International Paper, Motorola and Chicago; a Business Roundtable with members agreeing to measure annual GHG emissions, then publicly report the total and reduce them by a certain amount; and a Climate Group Survey comprised of 22 major corporations, 143 cities, 10 state and 6 countries. Five corporations reduced GHGs by at least 60% and saved a combined \$5.5 billion through energy efficiency, fuel switching and reduced waste output.

There are several state and regional programs for voluntary emissions registers and reductions including the California Climate Action Registry. There is also a Regional Greenhouse Gas Initiative in nine northeast states involving development an emission cap and trade program for carbon dioxide from power plants by April 2005. Other programs include California motor vehicle GHG emission standards and their possible adoption by seven other Northeast states; as well as a subsequent lawsuit against six electric utilities regarding regulation of carbon dioxide. Also, the McCain Lieberman bill (S 139) was rejected when first presented by a vote of 97-0. However, it was defeated more recently but by a much closer margin of 53 to 47. Its advocates believe that, with persistence, it will eventually pass.

What is particularly at stake for companies is that they will experience an increase in energy costs as a percentage of operating costs increase with the transition from coal to natural gas, which may consume 10 - 15% of operating profits, with corresponding impacts on stock prices.

There is considerable linkage between GHG emissions and regulated criteria pollutants. Most GHGs derive from fuel combustion, and reductions in fuel combustion reduce emissions of nitrous oxide (NOx) and volatile organic compounds (VOCs), as well as methane. There are measures that aim to reduce ozone, particulates, and air toxics but also results in GHG emission reductions. Air pollution control measures which have broad applicability are energy conservation, increases in energy efficiency, motor vehicle emissions reductions, vehicle emission standards, transportation control measures, land-use planning and zoning, smart growth, air quality elements in general plans, traffic and roadway measures, public transit, congestion relief measures, and carpool lanes.

There are emerging areas in which an Air District's role in GHG emission management may be discerned. Staff is developing a list of 24 areas in which to reduce GHGs, including adoption of a resolution on global warming, development of a GHG emission inventory, various levels of inter-agency cooperation, public education, grants and funding, and development of model global warming language for inclusion in the air quality elements of local general plans.

Under the Kyoto Protocol, emission credits may be created by sponsoring projects that reduce GHGs, and there are a wide variety of opportunities for doing so that also afford contexts for aligning fiscal and self-interest. Emission reductions created in one of the countries that has ratified the Protocol may be banked. The California Climate Action Registry banks and credits emission reductions, and although a mandatory program is not in place in this country, the actions now taken to reduce GHGs might be able to be folded into the baseline.

Deputy Air Pollution Control Officers Peter Hess and Jean Roggenkamp inquired if the Committee might endorse a broad conceptual approach in which staff would draft a resolution on Climate Change for consideration by the full Council at its May 11, 2005 Regular Meeting. The text would identify links between criteria pollutant regulation, public health and reduction in GHG emissions.

Chairperson Hayes called for discussion on concepts that staff might find useful in composing the text. Mr. Altshuler opined that GHG-related criteria could be built into the grant criteria process. Moreover, a stamp of public health protection could be affixed to GHG emissions with the implication that they be treated like criteria pollutants. GHG emissions affect the environment, which also affects health—in particular, the connection between increased emissions of GHGs and increases in ambient temperature, which in turn increase ozone formation and energy demand. In addition, wars are fought over energy sources to which GHG emissions are linked. Mr. Hanna moved that the Committee endorse the proposal that staff draft a resolution on Climate Change for consideration by the Council on May 11; seconded by Mr. Altshuler; carried unanimously.

Chairperson Hayes inquired as to the status of the list of 24 GHG emission reduction measures. Ms. Roggenkamp replied that the list referred to in the February 7 Technical Committee meeting was preliminary, and when it is further edited, it will be presented to the Committee for review.

6. **Committee Member Comments/Other Business.** Mr. Altshuler distributed a brochure entitled "Something Special in Sunnyvale" featuring a natural gas refuse truck with low emissions.
7. **Time and Place of Next Meeting.** The Committee agreed on two possible dates, to be determined after consultation with Air Quality Planning Committee (AQPC) Chair Holtzclaw: (a) Wednesday, June 8, 2005 at 9:30 a.m., joint meeting with the AQPC, or (b) Tuesday, June 7, 2005 at 9:30 a.m., Technical Committee only, 939 Ellis Street, San Francisco, CA 94109.
8. **Adjournment.** 11:00 a.m.

James N. Corazza  
Deputy Clerk of the Boards

:jc

Bay Area Air Quality Management District  
939 Ellis Street  
San Francisco, California 94109

May 26, 2005

To: Joint Air Quality Planning & Technical Committee

From: Stan Hayes, Chairperson, Technical Committee

Re: Technical Committee Review of Climate Changes Issues in 2005

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Set forth below are excerpts from the minutes of the meetings of the Advisory Council Technical Committee in 2005 at which the subject of climate change has been discussed.

**FEBRUARY 7, 2005 TECHNICAL COMMITTEE MEETING**

**Discussion of District's Role in Climate Change Issues.**

Joe Steinberger, Principal Environmental Planner, stated that last year the District entered into a contract with Sonoma County. It is comprised of two phases. The first concerns conducting an inventory of greenhouse gas (GHG) emissions inventory. The second focuses on programs that concern criteria pollutants and how these interface with GHG emissions. This project should be completed by the year's end.

The District is involved in an energy grant to the Bayview Hunters Point area for energy efficiency measures to reduce local GHG emissions. The project will employ residents to engage in energy efficiency projects regarding replacement of lights and thermostats.

The District has also incorporated GHG issues into ozone strategy, through several measures. One promotes energy conservation through adoption by local governments of model ordinances. Transportation Control Measures (TCMs) that reduce vehicle trips and encourage use of alternative modes of transportation also reduce GHG emissions. Also, the District has put together a website addressing global climate change and GHG emissions, which addresses the history of climate change and identifies measures the District has implemented. Working with the International Council for Local Environmental Initiatives (ICLEI), the District is discussing development of a GHG emissions inventory for the Bay Area, and the entry of data into the "Clean Air and Climate Protection Software" that ICLEI has developed. This will supplant local government agencies having to conduct their own emission inventories, although they can still identify their own mitigation measures. The California Climate Registry will sponsor a conference on GHGs later this year, in which the District will participate. Santa Clara County has requested that the District partner with it in developing a climate change resolution. The District has also reviewed Marin County's general plan for climate change measures. Mr. Colbourn noted that the District will roll out a GHG emission program this June in anticipation of the District's celebration of its 50<sup>th</sup> Anniversary. The District will also participate in World Environment Day in the City this June.

Mr. Steinberger stated that the District has developed a draft list of 24 areas in which to reduce GHGs. These include development of a GHG emissions inventory, further development of the District's website to include GHG issues, adoption of a District resolution on GHGs, consideration of GHGs in eligibility criteria for mobile source programs, further investigation of the link between criteria pollutant and GHG emission reductions, and cooperation with regional agency partners to address climate change. The Committee requested to receive the staff list and offer comments on priorities and implementation. Mr. Colbourn suggested the Committee add to it and provide technical advice. Mr. Hilken added that staff is also looking for ways to outreach to cities and counties through smart growth programs, modification of air quality elements in general plans and of local plan guidance on energy efficiency, and adoption of model ordinances for energy conservation. Staff is looking to see what incentive opportunities are also available through grants and funding programs sponsored by the Metropolitan Transportation Commission (MTC). Ms. Bailey suggested that staff consider adding GHGs to the District's permit program, and also focus on such renewable fuels efforts as San Francisco's bio-diesel program which may collect restaurant grease.

On the matter of legal authority, Mr. Steinberger noted that the California Air Resources Board adopted a mobile source emission regulation for GHGs, which was successfully challenged in court based on EPA's determination that CO<sub>2</sub> is not an air pollutant. However, there may be some level of authority available to the District under the California Clean Air Act (CCAA). Chairperson Hayes noted that New Jersey has declared CO<sub>2</sub> a pollutant and is attempting to regulate under that finding, although controversy has ensued. Mr. Altshuler stated that the opportunity to include GHG emission reduction credit for the mobile source programs is timely and should be pursued. Emissions of lubrication oil in engines, as well as the sequestration of carbon, ought also to be considered.

Messrs. Colbourn and Hilken stated that staff is working on next fiscal year's budget and may request additional staff for working on GGH emissions issues. In the interim, the Committee can review the list of GHG measures and offer advice on priority, implementation and technical aspects.

Mr. Lapera apprised the Committee on the status of the program to remove 1,500 acres of eucalyptus trees in the East Bay Regional Park District, and how this will reduce biogenic emissions of isoprene, which is the major ozone precursor emitted by eucalyptus trees.

Eucalyptus trees are not indigenous to the area, and the park environment will be returned to its native Oak Bay Laurel woodlands. Biogenic emissions of isoprene will be reduced along with fire hazard. This provides a unique opportunity for cooperation between the Air District, the park district and environmental groups. The extent to which this fuels management program has the potential to reduce emissions of GHGs requires further assessment. Ms. Bailey observed that isoprene is less an air pollution problem than wildfires. Mr. Hilken noted that staff supports municipal tree planting projects to reduce urban heat islands, and sends letters to cities and counties encouraging them to plant trees after review of the tree emission profiles.

The Committee requested staff to transmit the list of 24 GHG emission reduction measures for Committee review and prioritization. It agreed that it is important to track the extent to which these may dovetail with the District's CARE program and efforts to meet both the ozone and PM standards. If there is a need for funding separate programs to reduce CO<sub>2</sub> emissions, that is also important to review. Dr. Holtzclaw urged coordination with the Air Quality Planning Committee where possible, including the possibility of holding a joint meeting. Chairperson Hayes stated that some information gathering would be useful at the outset to assess what the GHG emissions inventory looks like in the Bay Area, and to get a sense of the primary sources of such emissions.

The Committee agreed to request a speaker from the Climate Action Network to address the Committee on the matter of Bay Area GHG emissions. Related issues concern the linkage with criteria pollutants, the reduction of combustion which generates the most CO<sub>2</sub>, along with energy efficiency issues. Mr. Lopera suggested there is a need to schedule the remaining meeting agendas in accordance with the staff's schedule and the Committee's goal of developing by the end of this year a recommendation for staff consideration. At the next Advisory Council Regular meeting in March, there will be an opportunity to further review the Committee's schedule on this topic.

In addition to the information gathered from the presentation on GHG emissions and the discussion of the District's 24 GHG emission reduction topics, the Committee requested that District staff make a presentation at its next meeting on diesel emissions within the context of the District's CARE program. The Committee agreed that its work on the topic of cleaning up diesel engines should be limited to the context of the CARE plan. The primary areas of focus should be source apportionment and monitoring methods for diesel which distinguish new from old carbon and use the former as a tracer for diesel emissions.

### **APRIL 13, 2005 TECHNICAL COMMITTEE MEETING**

**Continuing Review of Climate Change Issues.** Committee Chair Hayes presented "Management of Greenhouse Gases: Recent Developments." He noted that the greenhouse effect is one in which solar radiation passes through the clear atmosphere and is absorbed by the earth's surface and warms it. Some of this infrared radiation is absorbed and re-emitted by the greenhouse gas molecules and the direct effect is the warming of the earth's surface and the troposphere. A temperature plot going back 1,000 years—with estimates prior to 1902 based on tree rings and ice core sampling and instrumental data thereafter—shows significant temperature increases since the 1970s, and particularly since 2000. Thermometer readings from 1860 to 2000 confirm this trend.

Six greenhouse gases are the subject of the Kyoto protocol: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride, although not all of these are of equal potency as greenhouse gases (GHGs): the latter being 23,900 times as potent as the first. In 2000, 83% of emissions of GHGs in the US were carbon dioxide, with methane at 9%, nitrous oxide at 6% and hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride at 2%. For carbon dioxide, the energy industry contributes 35%, transportation 26%, manufacturing and construction 12%, commercial, institutional and residential 9%, agriculture 7%, industrial processes 4%, fugitives from fuel production 3% and waste 3%. More than 50% of GHGs in the US were emitted by the electric power production industry. From 1990 to 2000, there is a continual increase in carbon dioxide emissions from the commercial, residential, transportation and industrial sectors.

The Kyoto Protocol establishes binding limits for 38 developed countries to reduce GHGs from 2008 to 2012 by 5% relative to a baseline developed in 1990. To be valid, the Kyoto Protocol required ratification by 55 governments, within which the ratifying governments included developed countries representing at least 55% of that group's 1990 carbon dioxide emissions. This occurred when Russia ratified the Kyoto Protocol in November of last year. The Protocol took effect February 16, 2005, affecting 126 nations. Only four industrialized countries have not ratified the Kyoto Protocol. These are: Australia, Liechtenstein, Monaco and the United States.

The European Union (EU) thought the Kyoto Protocol would be approved and moved forward on its own. Now every one of 30,000 stationary sources in the EU must have an operating permit that limits

GHG emissions. This covers about 45% of the carbon dioxide emissions in the EU. Penalties for non-compliance range from 40 to 100 euros per ton of carbon dioxide emitted. National allocation plans were established March 31, 2004 indicating how the reduction in GHG emissions would be allocated. During 2005-2007, 40 euros per tons will be assessed for violating the carbon dioxide emission allowance, and between 2008 and 2012 it will be 100 euros per ton.

In the United States, a Global Climate Change Initiative by the Bush Administration has selected to cut GHG “intensity” by 18% over the next 10 years. Improved GHG registry information is being sought, and will protect transferable GHG emissions reduction credits. Some voluntary initiatives for GHG emissions reporting and reduction include an internal trading program sponsored by BP Amoco and Shell; the Chicago Climate Exchange, with 14 founding members including American Electric Power, DuPont, Ford, International Paper, Motorola and Chicago; a Business Roundtable with members agreeing to measure annual GHG emissions, then publicly report the total and reduce them by a certain amount; and a Climate Group Survey comprised of 22 major corporations, 143 cities, 10 state and 6 countries. Five corporations reduced GHGs by at least 60% and saved a combined \$5.5 billion through energy efficiency, fuel switching and reduced waste output.

There are several state and regional programs for voluntary emissions registers and reductions including the California Climate Action Registry. There is also a Regional Greenhouse Gas Initiative in nine northeast states involving development an emission cap and trade program for carbon dioxide from power plants by April 2005. Other programs include California motor vehicle GHG emission standards and their possible adoption by seven other Northeast states; as well as a subsequent lawsuit against six electric utilities regarding regulation of carbon dioxide. Also, the McCain Lieberman bill (S 139) was rejected when first presented by a vote of 97-0. However, it was defeated more recently but by a much closer margin of 53 to 47. Its advocates believe that, with persistence, it will eventually pass.

What is particularly at stake for companies is that they will experience an increase in energy costs as a percentage of operating costs increase with the transition from coal to natural gas, which may consume 10 - 15% of operating profits, with corresponding impacts on stock prices.

There is considerable linkage between GHG emissions and regulated criteria pollutants. Most GHGs derive from fuel combustion, and reductions in fuel combustion reduce emissions of nitrous oxide (NOx) and volatile organic compounds (VOCs), as well as methane. There are measures that aim to reduce ozone, particulates, and air toxics but also results in GHG emission reductions. Air pollution control measures which have broad applicability are energy conservation, increases in energy efficiency, motor vehicle emissions reductions, vehicle emission standards, transportation control measures, land-use planning and zoning, smart growth, air quality elements in general plans, traffic and roadway measures, public transit, congestion relief measures, and carpool lanes.



There are emerging areas in which an Air District's role in GHG emission management may be discerned. Staff is developing a list of 24 areas in which to reduce GHGs, including adoption of a resolution on global warming, development of a GHG emission inventory, various levels of inter-agency cooperation, public education, grants and funding, and development of model global warming language for inclusion in the air quality elements of local general plans.

Under the Kyoto Protocol, emission credits may be created by sponsoring projects that reduce GHGs, and there are a wide variety of opportunities for doing so that also afford contexts for aligning fiscal and self-interest. Emission reductions created in one of the countries that has ratified the Protocol may be banked. The California Climate Action Registry banks and credits emission reductions, and although a mandatory program is not in place in this country, the actions now taken to reduce GHGs might be able to be folded into the baseline.

Deputy Air Pollution Control Officers Peter Hess and Jean Roggenkamp inquired if the Committee might endorse a broad conceptual approach in which staff would draft a resolution on Climate Change for consideration by the full Council at its May 11, 2005 Regular Meeting. The text would identify links between criteria pollutant regulation, public health and reduction in GHG emissions.

Chairperson Hayes called for discussion on concepts that staff might find useful in composing the text. Mr. Altshuler opined that GHG-related criteria could be built into the grant criteria process. Moreover, a stamp of public health protection could be affixed to GHG emissions with the implication that they be treated like criteria pollutants. GHG emissions affect the environment, which also affects health—in particular, the connection between increased emissions of GHGs and increases in ambient temperature, which in turn increase ozone formation and energy demand. In addition, wars are fought over energy sources to which GHG emissions are linked. Mr. Hanna moved that the Committee endorse the proposal that staff draft a resolution on Climate Change for consideration by the Council on May 11; seconded by Mr. Altshuler; carried unanimously.

Chairperson Hayes inquired as to the status of the list of 24 GHG emission reduction measures. Ms. Roggenkamp replied that the list referred to in the February 7 Technical Committee meeting was preliminary, and when it is further edited, it will be presented to the Committee for review.

Bay Area Air Quality Management District  
939 Ellis Street  
San Francisco, California 94109

May 26, 2005

To: Joint Air Quality Planning & Technical Committee

From: Stan Hayes, Technical Committee Chairperson

Re: Review of Community Air Risk Evaluation (CARE) Program

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Set forth below are excerpts from the minutes of the Technical Committee meetings in 2005 at which the subject of the District's CARE Program has been discussed.

**FEBRUARY 7, 2005 TECHNICAL COMMITTEE MEETING**

**Discussion of the District's Community Air Risk Evaluation (CARE) Program.** Janet Stromberg, CARE Program Manager, stated that the CARE program goals include evaluation of health risk from toxic air contaminants, public outreach and the planning and implementation of risk reduction strategies. Program objectives include public outreach, development of emission inventory and emission density maps, technical and analytical quality assurance, a detailed pilot cumulative risk assessment from stationary sources in a neighborhood, the identification of risk reduction opportunities and the implementation of a risk reduction plan. Public outreach and input will be sought from the District's Advisory Council, the CARE Advisory Committee, and the public at community meetings and workshops on regulatory proposals. The District's website will be revised with information derived from the CARE program, and regulatory proposals will very likely follow, with the District possibly seeking regulatory authority where necessary.

The District's work will commence with developing an emission inventory. Subsequent emission density maps will focus on area and point sources, on-road motor vehicles, criteria pollutants and toxic air contaminants. The emission inventory work on area sources is largely complete. Geographical Information System (GIS) maps will house all the emission inventory data, and the software has been purchased and installed on several District workstations for this purpose.

Staff is analyzing particulate matters (PM) on filters with the aim of distinguishing old from new carbon. Analytical equipment for the laboratory has been purchased for this purpose. At the end of January a draft report was completed. Emission models will observe individual profiles of emission species and correlate them with sources, to ensure reliability of emission density maps.

The District will use data from emission density maps, modeling analysis and census data on the demographic characteristics of neighborhoods to choose a neighborhood in which to conduct a detailed cumulative risk analysis. District records will also be audited for accuracy. The area selected for analysis will be analyzed for terrain features and population profiles. Risk reduction opportunities will then be identified and a risk reduction plan developed for implementation.

Letters of invitation have been sent to prospective members to form a CARE Advisory Committee. Prospective members are being sought from academic backgrounds, community organizations and advocacy groups, regulated industries, and medical and public health backgrounds. This Advisory Committee will first meet on February 17, 2005 and thereafter on a bi-monthly basis.

In reply to questions, Ms. Stromberg stated that the pilot neighborhood to be studied on a cumulative risk basis will be chosen based on identification of where the toxic impacts are the highest. Overview maps of the entire Bay Area will be combined with data from mobile point and area sources in order to identify the high impact areas. Staff will also assess the population groups who are suffering the greatest impacts. If successful, the program may lead to the study of other neighborhoods. Jack Colbourn, District Policy Advisor, indicated that as the project matures staff will return to the Technical Committee for advice on selecting the neighborhood to be studied. He suggested that a joint meeting be held with the CARE Advisory Committee at a future point.

Chairperson Hayes noted that as estimates are that as much as 70% of air toxics risk derives from diesel engine emissions, the emission inventory for diesel is particularly noteworthy. Monitoring is therefore especially important and the means by which measurements of elemental carbon are used to derive diesel particulate levels are critical to assess. The Technical Committee can provide its advice on this methodology. Ms. Stromberg noted that preliminary results show considerable new carbon in the portion of elemental carbon on the PM filters, which is somewhat surprising. The key findings in the preliminary draft report include:

- a. most anthropogenic PM<sub>10</sub> or PM<sub>2.5</sub> derives from wood and fossil fuels. New carbon is not derived from fossil fuels.
- b. geological dust is a small contributor to PM<sub>10</sub> and negligible to PM<sub>2.5</sub>
- c. tire and brake wear contributes little to PM concentrations
- d. peak PM concentrations occur in winter
- e. ammonium nitrate is a contributor to PM
- f. carbonaceous PM accounts for half of PM<sub>10</sub> and PM<sub>2.5</sub>; ammonium sulfate is a major contributor to annual PM but small to peak PM.

Henry Hilken, Environmental Planning Manager, stated that in parallel with the work on the CARE program, the District is involved in PM planning as a response to legislation passed last year. Regulatory proposals will be brought to the District's Board of Directors this summer.

#### **APRIL 13, 2005 TECHNICAL COMMITTEE MEETING**

**Update on the District's Community Air Risk Evaluation (CARE) Program.** Janet Stromberg, CARE Program Manager, stated that the District will contract with Sonoma Technologies, Inc., to develop toxic air contaminant (TAC) emission inventory/emission density maps for the Bay Area. These will include an inventory of annual average TAC emissions from area, point- and on-road motor vehicle sources, and weight TAC emissions according to their toxicity. These maps should be completed within three months of the date the contract is signed. District staff is also receiving training in graphical interface system (GIS) mapping, in order to augment in-house capability.

The District is also working to better understand exposures to TACs through measurements and monitoring. It will also add two canister samplers in the neighborhood selected for a cumulative risk assessment pilot project and compare the data gathered with data from the broader emission monitoring network. The goal is to improve the ability to identify ambient diesel particulate (PM).

Attempts to improve the identification of diesel PM are underway. Chemical mass balance analyses show that most anthropogenic PM<sub>10</sub> and PM<sub>2.5</sub> derive from burning wood or fossil fuels. Geological dust, and tire and break wear are small contributors to PM<sub>10</sub> and PM<sub>2.5</sub>. Peak PM concentrations occur in winter due to meteorological conditions conducive to ammonium nitrate production and wood combustion. Carbonaceous PM accounts for about half of peak PM<sub>10</sub> and PM<sub>2.5</sub> and also annual PM<sub>2.5</sub>. Ammonium sulfate is a significant contributor to annual PM<sub>2.5</sub> but only a small contributor to peak concentrations of PM.

Carbon 14 analysis is being used to distinguish the amount of new and old carbon present in a PM sample. The results from 20 samples taken on five separate days suggest that PM from fossil fuel combustion is much lower than previously thought. New techniques developed by Desert Research Institute (DRI) and CalTech, which speciate hydrocarbons for hopanes and steranes, will be used to distinguish gasoline and diesel PM from other fossil fuel carbon. Certain polycyclic aromatic hydrocarbons (PAHs) are found in greater quantities in gasoline PM than in diesel, while certain polar organics provide markers for wood burning and cooking. These will be identified in the speciation.

In reply to Committee member questions, Ms. Stromberg, Peter Hess, Deputy Air Pollution Control Officer, and Gary Kendall, Technical Division Director, made the following points:

- the CARE program will conduct a cumulative risk analysis for a pilot project neighborhood, and its Task Force will provide input for identifying criteria for a pilot neighborhood. These will be combined with the data from the TAC emission maps and a final selection will be made.
- the best available science will be used in assessing concentrations of diesel PM in ambient air. DRI is confident that new markers have been identified for diesel PM in its hydrocarbon speciation. Staff is in the process of discussing additional research projects with DRI.
- staff has tracked measurements obtained during wildfires to distinguish peak versus annual PM concentration. The field of measurement and analysis is expanding, and next week a major conference on this subject is taking place in San Francisco with many well-known experts. A focus on “nano-particulates” is developing in this field.
- the choice of a pilot neighborhood will include not only potential regulatory action that may be taken on a source to reduce TACs, but also creative approaches beyond regulation, and the availability of grant money will provide for the opportunity. The District will seek legislation to obtain additional regulatory authority. The recommendation on which neighborhood to select will be presented to the Council before a decision is made. It is anticipated that the decision could be made some time in the fall of this year.
- communication and public outreach will be a critical component of the CARE program.
- the staff report, distributed at each Committee member’s place, entitled “Sources of Bay Area Fine Particles: A Chemical Mass Balance Analysis,” dated April 2005, is preliminary. When it is near completion, staff will present it to the Council with a more detailed technical focus. Mr. Altshuler’s observations that lube oil has unique markers, and that referring to the coefficient of haze when a filter contains ammonium nitrate, are useful.

Bay Area Air Quality Management District  
939 Ellis Street  
San Francisco, California 94109

May 26, 2005

To: Joint Air Quality Planning & Technical Committee

From: John Holtzclaw, Ph.D., Air Quality Planning Committee Chair

Re: Committee Review of Hydrogen Highway Blueprint

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Set forth below are excerpts from the minutes of the Air Quality Planning Committee meetings in 2005 at which the subject of the hydrogen highway has been discussed.

**FEBRUARY 7, 2005 AIR QUALITY PLANNING COMMITTEE MEETING**

**The Current Status of Hydrogen Production and Fuel Cell Technologies and Recent California and U.S. Government Initiatives.** Dr. Tim Lipman, U.C. Berkeley, stated that fuel cell technology has progressed over the last decade, but there remain some obstacles in terms of hydrogen production and distribution. He opined that at this time what may be needed is a broad, clean energy strategy of which the hydrogen fuel cell technology is an increasing part. Also, given the state's legislative concern over greenhouse gas (GHG) emissions with the Pavley bill, it is important to assess the fuel economy of fuel cell vehicles (FCVs) and hybrids of various types.

Dr. Lipman reviewed the various fuel cell types, noting that the ion exchange membrane cell is intended for vehicle use, entails low temperature transfer and uses platinum as the catalyst material. Phosphoric acid cells have to date proven to be the most useful for stationary source applications, with such other technologies as molten carbonate and solid oxide becoming increasingly feasible for stationary application. At high temperature nickel can be used as the catalyst and is cheaper.

Displaying a diagram of how a fuel cell works, Dr. Lipman explained that hydrogen enters the cell and makes contact with the catalyst, splits into two protons and electrons, and as the protons go through the membrane, the electrons travel around the external circuit to meet oxygen and the protons to form water, generating electricity. Fuel cells can be stacked, and these assemblies can produce a high voltage system of many cells. The power density of fuel cells has increased dramatically in the last decade: in 1994 a cell generated 200 watts per liter and recently General Motors generated 2 kilowatts per liter from a fuel cell.

Displaying a series of photographs of early and mid-1990s Daimler Prototype FCVs, Dr. Lipman identified where the fuel cells were installed. He noted that considerable efficiencies have been obtained in the vehicle design of the Daimler/Chrysler Nocar 4 FCV, which represents the "next generation" of FCVs. The Air District will receive two of these vehicles in the near future. While the vehicle is production ready, there are cost issues, and concerns over the unavailability of hydrogen fueling stations in the state at this point.

FCVs presently cost \$3,000 - \$4,000 per kilowatt, compared with \$40-\$50 per kilowatt for gasoline fueled vehicles. However, FCVs are not mass produced at this time. Under some mass production scenarios, the cost of an FCV would be \$200 per kilowatt. This is strictly in terms of the capital cost of the fuel cell system. When durability is factored in, it should be noted that platinum is fairly fragile and susceptible to being poisoned by sulfur or physically damaged from vibration and wear and tear. Fuel cells tend to last upwards of a couple of thousand hours, but in order to be competitive with gasoline engines performance of up to 4,000 hours would be needed.

With regard to hydrogen production infrastructure, centralized strategies such as coal, nuclear and biomass entail low production costs but high transportation costs. It may be possible to sequester the CO<sub>2</sub> emissions although this technology is not fully proven. Distributed hydrogen production, using natural gas or electricity as a source and electrolysis for production entail higher production costs but much less distribution and transportation costs. Oil refineries with hydrocrackers generate a considerable amount of hydrogen, which could support mobile refueling station options.

Dr. Lipman displayed a map of the USA showing the potential for hydrogen production from various types of power, including renewable energy, biomass, solar and wind. He also described options for hydrogen production and distribution within the context of on-site production at larger centralized plants and subsequent distribution. He displayed the latest models for mobile hydrogen refueling technology, with a trailer fueled at a central hydrogen facility and towed to a fueling area. This is reasonably economical if the trailer operates within 100 miles of a hydrogen facility. The Governor has spoken of developing an infrastructure of a hydrogen station every 20 miles.

Cost and emission estimates vary with different means of hydrogen production and whether they are near- or long-term. He noted that in general where there are lower production costs there are higher transportation costs. With regard to renewable energy in wind and solar power, costs are high, but over the future these are projected to decrease. The National Academy of Scientists commissioned a study of centralized, medium production scale and distributed options, taking into account production, distribution and dispensing costs, CO<sub>2</sub> sequestration and a carbon tax. Centralized production was the least expensive, with medium production scale ranking next costly, and the distributed option in some ways being comparable with the centralized approach.

FCVs do not emit GHGs, but some hydrogen production processes do. Therefore, the entire fuel cycle is at issue. Using natural gas to generate hydrogen, a 20-40% reduction in GHGs can be achieved. Using an electrolyzer increases GHG emissions due to the use of coal. With GHGs it is not important where emissions occur, but with regard to air pollutants it is important to know the location of where the emissions occur, particularly if there are hot spots within a region. The type of hydrogen production will determine the type of pollutants emitted upstream in the fuel cycle, and the District requires clear advice on the implications of a given production technology.

Dr. Lipman displayed a map of the location of 15 hydrogen stations in California, noting that there are six more planned for construction. He also displayed a diagram of a distributed hydrogen system using natural gas for hydrogen production and identifying the process for transfer to a reformer, compression, storage and dispensing to a vehicle. In reply to questions he noted that home refueling using natural gas supplied to a residence is under consideration, and that some advocate simply using compressed natural gas for natural gas vehicles in such cases. There are also economies of scale to be considered, because the installation of reformers in homes, in order to be economical, would have to be mass produced in order to drive the cost down.

The challenge that faces the hydrogen fuel cell technology today is akin to the “chicken or the egg” syndrome. Energy stations could combine reformer and production technology in a stationary place to produce power, and an offshoot would be the production of hydrogen to refuel vehicles. However, the infrastructure overall (production, delivery, trucks, gas trucks, pipelines) will not be developed unless there are vehicles purchased, and people won’t purchase vehicles unless there is infrastructure to support them. Small energy production stations are a possible solution, and could support business and agency fleets to begin with, and expand into key corridors. Such facilities could be made available to the public and the process could begin in that manner. To date, there have been only a few minor accidents associated with the hydrogen production technology.

There are some major government initiatives under way regarding hydrogen, with the US Department of Energy’s FreedomCar program beginning in 2003. In April of last year, the allocation of \$350 million was announced regarding a hydrogen storage program, learning demonstrations, fuel cell research and hydrogen education. California Governor Schwarzenegger has issued an Executive Order designating 21 Interstate Highways as the California Hydrogen Highway network, with projected infrastructure development by 2010 with production of hydrogen from renewable energy sources. The blueprint for this plan is due to be issued very shortly. It will identify a rapid transition to a hydrogen economy in the state, institute negotiations with automobile manufacturers to ensure the availability of cars on the market, the development of safety standards, emergency response procedures, incentives for vehicle purchase and advocacy of renewable energy sources for producing hydrogen. The website is [www.hydrogenhighway.ca.gov](http://www.hydrogenhighway.ca.gov).

In summary, Dr. Lipman stated that while FCVs are coming on strong there are still technical and economic challenges. Hydrogen production can be approached from a variety of ways with varying environmental impacts and economic implications. There is considerable governmental activity at the state and federal level, but budgets across the board are tight. Overall, a broad clean energy strategy is appropriate at the present time, with clean sources of electrical power and other clean fuels that provide a basis for transition to hydrogen power. Public expectations as to the availability and implementation of FCV technology must be responsibly managed.

In response to questions from Committee members, Dr. Lipman replied:

- From an air quality perspective, clean fuel vehicles can be distinguished from clean vehicles in that the latter can be achieved running on conventional fuels. In such instances, durability over time becomes a key factor in comparing the two approaches to vehicular motive power.
- Platinum fuel cells could be poisoned over time in an urban area where there is enough CO<sub>2</sub> in the air and potentially in the fuel stream to poison the membrane.
- Durability issues in comparison with electric battery powered vehicles require further operational experience in order to provide a good baseline of data. If battery powered vehicles had batteries that lasted the life of the vehicle they would be economically attractive.
- Platinum is recyclable as a fuel cell component. The cost has reduced dramatically in the last decade.
- The target date of 2010 for the hydrogen highway is rather early; it appears more realistic to see this as a stepping stone of sorts.
- There are opportunities for an international partnership on the hydrogen fuel cell technology, particularly given that many automobile companies are global in scope.



- The use of natural gas as a hydrogen production source does not entail a shortage as estimates are that there are one million cubic feet of natural gas on the planet for every person.
- Distributed power generation through use of a power plant in a building would eliminate the need for a back-up diesel generator and provide for production of hydrogen as well

Michael Murphy, Advanced Projects Advisor, stated that with regard to incentives in the hydrogen highway blueprint, it is noteworthy that air districts have been major underwriters of clean fuels projects. The blueprinters will look at the District as a major funding source. Perhaps the Council could opine on where to place incentive funds under mobile source programs to a hydrogen fuel cell program, particularly in the overall context of the District's support of other clean vehicle and clean fuels programs.

The Committee thanked Dr. Lipman for his presentation. Chairperson Holtzclaw indicated that the next Committee meeting will be held jointly with the Technical Committee to discuss the CARE program and GHG emission issues. After further discussion, the Committee agreed to hold an interim meeting in March to receive a presentation on the state's hydrogen highway blueprint.

#### **APRIL 4, 2005 AIR QUALITY PLANNING COMMITTEE MEETING**

**California Hydrogen Highway Blueprint.** Dr. Shannon Baxter-Clemmons, Special Advisor on Hydrogen and Renewables, California Environmental Protection Agency (Cal-EPA) stated that the draft Blueprint was officially released on March 30, 2005. The first presentation on the Blueprint was given to the National Hydrogen Association last week. This is the second such presentation.

The Blueprint's inception can be traced to January 6, 2004 when California Governor Arnold Schwarzenegger declared that he intended to promote hydrogen power and a hydrogen highway, and environmental health and economic growth simultaneously. His Executive Order S-7-04 designated 21 interstate freeways in the state as the Hydrogen Highway Network ("H2 CA Net"). He asked Cal-EPA to be the lead agency in developing the Blueprint for its development and implementation. The Governor perceives this approach as having energy security benefits as well. To date, three hydrogen stations have been formally designated as part of the H2 CA Net. There are 16 hydrogen stations in the State, but the other 13 are not yet sufficiently accessible to the public to be declared part of the H2 CA Net.

For assistance and oversight in developing the Blueprint, Cal-EPA put together an advisory panel of over 200 individuals from interest and stakeholder groups, each participating on a voluntary basis. These were allocated among five topic teams that developed independent reports, detailing an approach to the topic and offering roll-out strategies, assessing the status of technology, how to site the stations throughout the state, assessing societal benefits, economic challenges, implementation issues with regard to standards, codes and risk assessment, and public education.

The draft Blueprint contains seven reports. Volume I concerns policy documentation. Volume II addresses technical issues. Together, these represent the consensus of the advisory panel and its recommendations to the Governor. Five independently produced topic team reports follow.

The goal of the H2 CA Net is to diversify the sources of transportation energy used and to provide environmental and economic benefits. A phased approach will make use of existing alternative fuels and emerging technologies to help develop hydrogen use and to bridge the gap between today's alternative fuel technologies and hydrogen technologies of the future.

Its initial Phase I goal is to have 50-100 fueling stations throughout California, 2000 light-duty fuel cell vehicles (FCVs), 10 heavy-duty FCVs and five stationary or off-road applications. Phase II aims to establish 250 hydrogen fueling stations in a lower-usage mode, 10,000 light-duty FCVs, 100 heavy-duty FCVs, and 60 stationary and off-road vehicle applications. Phase III aims to double the number of light duty vehicles on the road to 20,000, achieve a number of at least 300 heavy-duty FCVs on the road as well as 400 stationary and off-road vehicle applications in operation.

Regarding station build up, the Blueprint contains an action plan and a biennial review process. The action plan is identified in Volume I and calls for the Governor to provide funding, while emphasizing public/private partnerships to build stations and procure vehicles. Societal benefit goals include increasing renewable energy sources and minimizing greenhouse gas emissions. Station build up will begin in urban centers and thereafter spread outward into California.

Cal-EPA and the Bush Administration differ on the station mix criteria. The former seek a diversity of hydrogen producing technologies whereas the latter emphasizes production from coal combustion processes. The advisory panel members agree that renewable energy sources for hydrogen production are to be emphasized, and note that renewable energy sources and hydrogen are reciprocally interconnected in a variety of ways. Also, the lowest cost option is not necessarily to be preferred, inasmuch as other technologies that will be available in the not-to-distant future will become increasingly important. Use of existing stations is highly emphasized along with the development of new ones. The advisory panel also recommends making maximum use of the existing natural gas infrastructure and believes that 50 stations can be established in California by the year 2010. Phase II plans for 250 hydrogen fueling stations which, in urban areas, could be accessible within 5 minutes. Bridging stations would be established between the Bay Area and Los Angeles.

The Blueprint calls for \$53.5 million in funding from the Governor over the next five years for this program. Cost-sharing schemes and incentives for FCVs have been discussed. A major challenge remains in finding ways to sustain the income needed to support the program beyond this time frame. The advisory panel believes that, if the vehicles can be manufactured the infrastructure can be created to meet the need, investment in infrastructure is manageable.

The conclusions concerning the CA H2 Net are as follows:

- The CA H2 Net is a broad initiative for diversifying transportation energy use and for providing environmental and economic benefits.
- The CA H2 Net should be implemented in Phases.
- CA H2 Net will continue to put California in a world class leadership position and position the State for the successful introduction of hydrogen technologies to meet transportation, power generation, and other energy demands in the future.
- The biennial review of the Blueprint will evaluate the pace with which introduction can occur.
- The State-led public-private partnership should begin work to implement the Action Plan.
- The State needs to initiate a funding source.

In response to questions from the Committee members, Dr. Baxter-Clemmons stated:

The auto manufacturers require no convincing that the fuel cell is the future of the vehicle market. One manufacturer forecasts a global approach to the fuel cell vehicle (FCV), in which the basic structure of the FCV would be the same in terms of the frame and fuel cell location, and only the external body would differ—being tailored to each country in which the FCV is sold. This will enable mass production in the largest possible scale and enhance FCV economic attraction. Auto manufacturers have declared they will build a certain number of FCVs, and there is an increasing demand for them in Japan, Germany, Singapore, etc. The incentives created in California will send a message—in particular, to Japan—and although such incentives will not significantly draw down the cost of the vehicle, they will nevertheless assist as mass production capability increases.

The Department of Energy does not believe there is a shortage of the platinum that will be the primary component of the fuel cell, and the amount of platinum needed for a fuel cell decreases exponentially over time as technology improves. Phase III of the Blueprint will establish a basis for broad commercialization, with 20,000 FCVs planned for operation. This is a small percentage of the 20 million cars now driven in California, and some observers believe it will be three decades before the benefits of the Blueprint become manifest. Nevertheless, if the approach to a hydrogen transportation system is not started now, it will never come to fruition.

The history of alternate fuel and electric vehicles has been variously assessed. Electric vehicles still have a rather limited range, and General Motors recently held a symbolic “funeral” for its electric vehicle. Although hydrogen power requires an additional step in which electricity is used to produce hydrogen, never before have all of the stakeholders—environmentalists, car and fuel companies, and government—agreed on a technology that represents the future. Challenges remain with respect to renewable energy sources that are used to make the hydrogen and whether to use these to support existing infrastructure, the power grid or other applications.

The extent to which funding can be obtained for the Blueprint, and how hydrogen could be taxed, requires further discussion. A revenue bond has been suggested. The free market impact must also be considered where prices vary per kilogram, depending on the source producing the hydrogen. Transportation costs also factor in, along with taxes and possible renewable fuel subsidy.

Hydrogen stations may be variously used for both stationary and mobile source power, depending on whether the fuel cell is low or high temperature through electrolysis. Hydrogen stations in the early years of the Blueprint will be “delivered hydrogen” and will diversify from that point on.

Air Districts can assist with public education about the Blueprint, both in terms of short- and long-term goals regarding environmental and economic benefits, program safety, the various phases of the approach, and related aspects. Advocacy of more hydrogen fuel stations in the local Air District jurisdiction would be important, particularly in collaborating with fuel companies, local, regional and state government, and fire department staff. The Bay Area AQMD could be a major player in the development of the H<sub>2</sub> CA Net, and Cal-EPA would welcome working with staff.

Dr. Baxter-Clemmons offered to provide further information to Mr. Shanahan regarding cost comparison of a therm of natural gas in a natural gas vehicle in comparison with the same therm of natural gas delivered down the H<sub>2</sub> CA Net in order to produce hydrogen, and get it to a hydrogen fueling station. References and diagrams can be found in the report issued on the Internet (cf. p. 14, Volume I).

The cost of using bio-gas for vehicles, which occurs in Sweden, is decreasing, but it is not at a point at which it is cost-competitive. The H2 CA Net does not want to abandon near-term options for alternative fuels and vehicles. The approach to FCV's is not exclusive, and the societal benefits will increase as 20,000 such cars are on the road by the year 2015. If society wants hydrogen fuel as the basis for its transportation, it will have to start now and plan for the long-term.