



BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

ADVISORY COUNCIL MEETING

WEDNESDAY
JUNE 11, 2014
9:00 A.M.

7TH FLOOR BOARD ROOM
939 ELLIS STREET
SAN FRANCISCO, CA 94109

AGENDA

CALL TO ORDER

Opening Comments
Roll Call

Sam Altshuler, Chairperson
Clerk

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 Advisory Council 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 Council's purview. Speakers are limited to three minutes each.

1. Approval of Minutes of the May 14, 2014 Advisory Council meeting.

DISCUSSION

2. Discussion and finalization of draft report on the Advisory Council's February 13, 2014 meeting.

The Advisory Council will discuss and finalize the draft report on the February 13th meeting on "The Path Forward for the Energy Sector to Meet 2050 Green House Gas Goals" with Air District staff.

3. Discussion of draft report on the Advisory Council's May 14, 2014 meeting.

The Advisory Council will discuss and finalize the draft report on the May 14th meeting on "California's Energy Future and the Move Towards the 2050 Green House Gas Goals" with Air District staff.

OTHER BUSINESS

4. Council Member Comments/Other Business

Council Members may make a brief announcement, provide a reference to staff about factual information, or ask questions about subsequent meetings.

5. Report of the Executive Officer/APCO

6. Time and Place of Next Meeting

July 9, 2014 at 9:00 a.m. at 939 Ellis Street, San Francisco, CA 94109.

7. Adjournment

CONTACT EXECUTIVE OFFICE - 939 ELLIS STREET SF, CA 94109

(415) 749-5130
FAX: (415) 928-8560
BAAQMD homepage:
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.
- Any writing relating to an open session item on this Agenda that is distributed to all, or a majority of all, members of the body to which this Agenda relates shall be made available at the District's offices at 939 Ellis Street, San Francisco, CA 94109, at the time such writing is made available to all, or a majority of all, members of that body. Such writing(s) may also be posted on the District's website (www.baaqmd.gov) at that time.

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
939 ELLIS STREET, SAN FRANCISCO, CALIFORNIA 94109
FOR QUESTIONS PLEASE CALL (415) 749-5016 or (415) 749-4941

EXECUTIVE OFFICE:
MONTHLY CALENDAR OF AIR DISTRICT MEETINGS

JUNE 2014

<u>TYPE OF MEETING</u>	<u>DAY</u>	<u>DATE</u>	<u>TIME</u>	<u>ROOM</u>
Advisory Council Regular Meeting <i>(Meets on the 2nd Wednesday of each Month)</i>	Wednesday	11	9:00 a.m.	Board Room
Board of Directors Executive Committee <i>(Meets on the 3rd Monday of each Month)</i> - CANCELLED	Monday	16	9:30 a.m.	4 th Floor Conf. Room
Board of Directors Stationary Source Committee <i>(Meets Quarterly – At the Call of the Chair)</i> - CANCELLED	Monday	16	10:30 a.m.	Board Room
Board of Directors Regular Meeting <i>(Meets on the 1st & 3rd Wednesday of each Month)</i>	Wednesday	18	9:45 a.m.	Board Room
Board of Directors Budget & Finance Committee <i>(Meets on the 4th Wednesday of each Month)</i>	Wednesday	25	9:30 a.m.	4 th Floor Conf. Room
Board of Directors Mobile Source Committee <i>(Meets on the 4th Thursday of each Month)</i> - CANCELLED	Thursday	26	9:30 a.m.	Board Room

JULY 2014

<u>TYPE OF MEETING</u>	<u>DAY</u>	<u>DATE</u>	<u>TIME</u>	<u>ROOM</u>
Board of Directors Regular Meeting <i>(Meets on the 1st & 3rd Wednesday of each Month)</i>	Wednesday	2	9:45 a.m.	Board Room
Advisory Council Regular Meeting <i>(Meets on the 2nd Wednesday of each Month)</i>	Wednesday	9	9:00 a.m.	Board Room
Board of Directors Regular Meeting <i>(Meets on the 1st & 3rd Wednesday of each Month)</i>	Wednesday	16	9:45 a.m.	Board Room
Board of Directors Climate Protection Committee – <i>(Meets 3rd Thursday every other Month)</i>	Thursday	17	9:30 a.m.	Board Room
Board of Directors Executive Committee <i>(Meets on the 3rd Monday of each Month)</i>	Monday	21	9:30 a.m.	4 th Floor Conf. Room
Board of Directors Stationary Source Committee <i>(Meets Quarterly – At the Call of the Chair)</i>	Monday	21	10:30 a.m.	Board Room
Board of Directors Budget & Finance Committee <i>(Meets on the 4th Wednesday of each Month)</i>	Wednesday	23	9:30 a.m.	4 th Floor Conf. Room
Board of Directors Mobile Source Committee <i>(Meets on the 4th Thursday of each Month)</i>	Thursday	24	9:30 a.m.	Board Room

AUGUST 2014

<u>TYPE OF MEETING</u>	<u>DAY</u>	<u>DATE</u>	<u>TIME</u>	<u>ROOM</u>
Board of Directors Regular Meeting <i>(Meets on the 1st & 3rd Wednesday of each Month)</i>	Wednesday	6	9:45 a.m.	Board Room
Board of Directors Executive Committee <i>(Meets on the 3rd Monday of each Month)</i>	Monday	18	9:30 a.m.	4 th Floor Conf. Room
Board of Directors Regular Meeting <i>(Meets on the 1st & 3rd Wednesday of each Month)</i>	Wednesday	20	9:45 a.m.	Board Room
Board of Directors Budget & Finance Committee <i>(Meets on the 4th Wednesday of each Month)</i>	Wednesday	27	9:30 a.m.	4 th Floor Conf. Room
Board of Directors Mobile Source Committee <i>(Meets on the 4th Thursday of each Month)</i>	Thursday	28	9:30 a.m.	Board Room

MM – 6/5/14 (4:19 p.m.)

P/Library/Forms/Calendar/Calendar/Moncal

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Memorandum

To: Chairperson Sam Altshuler and Members
of the Advisory Council

From: Jack P. Broadbent
Executive Officer/Air Pollution Control Officer

Date: May 15, 2014

Re: Approval of Minutes of the Advisory Council Regular Meeting on May 14, 2014

RECOMMENDED ACTION

Approve the attached draft minutes of the Regular Meeting of the Advisory Council on May 14, 2014.

DISCUSSION

Attached for your review and approval are the draft minutes of the Regular Meeting of the Advisory Council on May 14, 2014.

Respectfully submitted,

Jack P. Broadbent
Executive Officer/APCO

Prepared by: Sean Gallagher

Attachment

Bay Area Air Quality Management District
939 Ellis Street
San Francisco, CA 94109
(415) 749-5073

DRAFT MINUTES

Advisory Council Regular Meeting
Wednesday, May 14, 2014

Note: Audio and webcast recordings of the meeting are available on the website of the Bay Area Air Quality Management District at <http://www.baaqmd.gov/The-Air-District/Board-of-Directors/Advisory-Council/Agendas-and-Minutes.aspx>.

CALL TO ORDER: Chairperson Sam Altshuler called the meeting to order at 9:05 a.m.

Roll Call:

Present: Chairperson Sam Altshuler, P.E.; Vice-Chairperson Liza Lutzker, M.P.H.; Secretary Jessica Range, LEED A.P.; and Members Ana M. Alvarez, D.P.P.D., Benjamin Bolles, Robert Bornstein, Ph.D., Jeffrey Bramlett, M.S., C.S.P., Harold Brazil, Heather Forshey, Stan Hayes, John Holtzclaw, Ph.D., Frank Imhof, Kraig Kurucz, Bruce Mast, Sara T L. Mayer, M.P.P., Timothy O'Connor, Esq., and Laura E. Tam.

Absent: Members Jonathan Cherry, A.I.A., Rick Marshall, P.E., P.L.S., and Estes Al Phillips.

Also Present: None.

RECOGNITION

1. Recognition of New Advisory Council (Council) Member (Agenda Item #2 Taken Out of Order)

Chairperson Altshuler introduced newly appointed Member Frank Imhof (*Agriculture*) and welcomed him to the Council. Member Imhof made introductory remarks.

Council Comments: None.

Public Comments: No requests received.

Council Action: None; informational only.

NOTED PRESENT: Member O'Connor was noted present at 9:08 a.m.

CONSENT CALENDAR

2. Approval of the Minutes of the April 9, 2014 Council Meeting (Agenda Item #1)

Council Comments: None.

Public Comments: No requests received.

Council Action:

Member Holtzclaw made a motion to approve the minutes of April 9, 2014; Member Lutzker seconded; and the motion carried by the following vote of the Council:

AYES: Altshuler, Alvarez, Bolles, Bornstein, Bramlett, Forshey, Hayes, Holtzclaw, Kurucz, Lutzker, Mayer, O'Connor and Range.

NOES: None.

ABSTAIN: Imhof, Mast and Tam.

ABSENT: Brazil, Cherry, Marshall and Phillips.

Opening Comments (Out of Order):

Chairperson Altshuler gave opening comments regarding the meeting agenda and outstanding action items, including year-end event planning and the delivery of an organization chart from staff, and announced the appointment of Members Forshey, Mast, Range and Tam to the report writing work group for the next report of the Council.

NOTED PRESENT: Member Brazil was noted present at 9:13 a.m.

PRESENTATIONS

3. California's Energy Future and the Move Towards the 2050 Greenhouse Gas (GHG) Goals

Eric Stevenson, Director of Technical Services, introduced Jane C.S. Long, Ph.D., and provided a brief description of her background.

A. California's Energy Future

Jane C.S. Long, Ph.D.

Contributing Scientist

Environmental Defense Fund

Former Principal Associate Director at Large and Associate Director for Energy and Environment

Fellow, Center for Global Strategic Research

Lawrence Livermore National Laboratory

Dr. Long gave a presentation entitled *California's Energy Future* (a copy of which is available on the website of the Bay Area Air Quality Management District at <http://www.baaqmd.gov/The-Air-District/Board-of-Directors/Advisory-Council/Agendas-and-Minutes.aspx>).

B. Reducing GHG Emissions through Energy and Innovation

Emilio Camacho, Esq.

Advisor to California Energy Commissioner Hochschild

Former Attorney with the Office of the Legislative Council

Mr. Camacho gave a presentation entitled *Reducing GHG Emissions through Energy and Innovation* (a copy of which is available on the website of the Bay Area Air Quality Management District at <http://www.baaqmd.gov/The-Air-District/Board-of-Directors/Advisory-Council/Agendas-and-Minutes.aspx>).

Council Comments: None.

Public Comments:

Carl Weinberg, Regulatory Assistance Project, addressed the Council regarding the long-standing awareness among industry leaders of the need for change and the need for comprehensive work and collaboration among all those involved.

Claire Broome addressed the Council regarding the difficult task of applying the information from today's presenters and the importance of identifying goals and recognizing the urgency of the situation; to encourage work on issues within the purview of the Air District and that the Air District become a thoughtful and creative leader towards their resolution; in support of a move to 100% renewable generation of electricity; and to encourage moving forward with experimental solutions despite a possible absence of certainty about outcomes.

Floyd Earl Smith, 350 Bay Area, addressed the Council to inquire about its receipt of a letter to the Council from 350 Bay Area, delivered May 13, 2014; to provide an update of events and efforts, as well as past engagement with the Board of Directors (Board), by 350 Bay Area; to provide information relative to the harm caused by the Fukushima nuclear disaster in Japan; and to express support for the draft Council report discussed on April 9, 2014.

Council Action: None; receive and file.

PANEL DISCUSSION

4. California's Energy Future and the Move Towards the 2050 GHG Goals

Council Comments:

The Council, speakers and staff discussed the role of methane gas as a GHG; what was taken into account by the presenters in consideration of the leakage issue; what level of optimism is appropriate given the data; the role of geoengineering; whether and in what form interagency workgroups exist which are addressing these issues; whether the nuclear storage issue is truly a technological or legal/political one; why biomass was presented as a viable solution in contrast to

information received in the past; what might be the proper policy action for a regional agency within the broader network of governments and regional agencies; specific examples of actions or strategies that have been attempted and met with success; importance of decarbonizing electricity generation, reducing automobile emissions and increasing energy efficiency; the cost of implementing the measures proposed by Dr. Long and, similarly, the measures proposed to the Council by Professor Mark Jacobson, Ph.D., on February 13, 2014, and the proper role of the Bay Area in their implementation; the industrial ecology approach and the advantages of experimenting with outcomes to better determine their actual effectiveness before implementation; how the Air District does and can improve its coordination with the California Energy Commission (CEC) relative to advancing the market penetration of renewable energy generation and siting considerations regarding facilities with GHG emissions; the relevance of carbon capture technology as a realistic solution, both now and in the future; written materials available regarding California's energy future, particularly that were drawn upon for today's presentations; the viability of emerging nuclear technology to offset the safety issues inherent to their development and implementation and the public perception of the same; that capital expenditures and public perception are the reasons so many of these issues are more complicated than they appear on their face; the importance of and challenges inherent to implementation of advanced energy efficiency and smart growth concepts in all construction; the possible involvement of the CEC in the regulation of the transportation sector; and proposed recommendations for the Council to carry forward to the Board.

Member Mast asked staff to help facilitate the distribution to the Council of the written material identified by the presenters as source material.

Public Comments: No requests received.

Council Action: None; receive and file.

PUBLIC COMMENT PERIOD: No requests received.

OTHER BUSINESS

5. Chairperson's Report: None.

6. Council Member Comments/Other Business:

Member O'Connor reported that he, on behalf of his employer, will be releasing a large report next week regarding the value of advancing market penetration of renewable energy generation and then provided an update on Senate Bill 1415 (Hill).

7. Report of the Executive Officer/Air Pollution Control Officer (APCO): None.

8. Time and Place of Next Meeting:

Wednesday, June 11, 2014, Bay Area Air Quality Management District Headquarters, 939 Ellis Street, San Francisco, CA 94109 at 9:00 a.m.

9. Adjournment: The meeting adjourned at 11:58 a.m.

Sean Gallagher
Clerk of the Boards

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Memorandum

To: Chairperson Sam Altshuler and Members
of the Advisory Council

From: Jack P. Broadbent
Executive Officer/Air Pollution Control Officer

Date: May 15, 2014

Re: Discussion of Draft Report on the Advisory Council Meeting on February 13, 2014

The attached draft report of the February 13, 2014, Advisory Council Meeting on *The Path Forward for the Energy Sector to Move Towards the 2050 Greenhouse Gas Goals*, as revised at the Advisory Council meeting on March 12, 2014 and April 9, 2014, will be discussed with Air District staff and finalized for approval.

Respectfully submitted,

Jack P. Broadbent
Executive Officer/APCO

Prepared by: Sean Gallagher

Attachment

**REPORT ON ADVISORY COUNCIL ACTIVITIES IN FEBRUARY-APRIL 2014:
THE PATH FORWARD FOR THE ENERGY SECTOR TOWARD
CALIFORNIA'S 2050 GREENHOUSE GAS (GHG) GOAL**

EXECUTIVE SUMMARY

This report summarizes ongoing activities of the Advisory Council during February-April 2014, consolidating presentations received, and subsequent discussion and consideration by Council members during this period. It is the intent of the Council to continue study of this topic throughout 2014. As more information is received and evaluated by the Council, conclusions and recommendations are expected to evolve, and will be documented in future reports.

The following presentations were made at the February 13, 2014 Advisory Council meeting:

1. *Roadmaps for Transitioning California and the Other 49 States to Wind, Water and Solar Power for All Purposes* by Dr. Mark Jacobson, Professor of Civil and Environmental Engineering and Director of the Atmosphere/Energy Program at Stanford University.
2. *California's Transition to a Low Carbon Economy: Infrastructure, Regulation, and Local Action* by Dr. Jim Williams, Chief Scientist at Energy + Environmental Economics, and until recently, an associate professor of international environmental policy at the Monterey Institute of International Studies.

A video recording of these presentations and the Council's discussion can be reviewed at baaqmd.granicus.com/MediaPlayer.php?publish_id=081f9418-e64b-1031-927d-78be5054b89b

Based on these presentations, the Council has identified several key emerging issues. Primary among these is the need for further investigation and definition of the most appropriate role for the District, both in its own activities and working in collaboration with other agencies also involved in the future of energy use and production in the Bay Area.

From its activities in February-April 2014, the Advisory Council has developed the following preliminary draft recommendations for further consideration during the year:

1. **Planning**: The District should consider joining together with other state, regional, and local agencies in a collaborative regional effort to plan for, facilitate, and coordinate energy-related response actions to assist in achieving the Bay Area's share of California's target of 80 percent reductions in GHG emissions by 2050.
2. **Coordination**: The District should encourage and support legislative and other efforts if needed to provide responsible planning agencies, including the District, with additional statutory and regulatory authorities and resources to coordinate and implement Bay Area energy-related response actions.
3. **Grants**: The District should further incorporate into its grant programs, as appropriate within its mission and statutory authorities, criteria that further incentivize electrification, clean energy and energy efficiency.
4. **Education**: The District should adopt an aggressive public education campaign that stresses the economic, health, and resiliency co-benefits of a shift to a low-carbon economy.

BACKGROUND

Professor Mark Jacobson

1. Jacobson has developed a 50-state roadmap for transforming the U.S. from dependence on fossil fuels to 100% renewable energy by 2050. Each state has the opportunity to transition to renewable wind, water, and solar (WWS) power for all purposes.¹
2. A comprehensive approach to future energy sector planning would consider more than carbon reduction. A 100% WWS strategy would consider all aspects of climate change and also minimize negative externalities associated with air pollution, public health impacts, and resource availability. According to Jacobson, the benefits of such a transition in California would be thousands fewer air pollution deaths per year, tens of billions of dollars in reduced global climate costs, tens of thousands of new jobs, and reduced future energy costs.
3. Given the scale and complexity of this transformation, action needs to begin. Reasons for needing this transition include the impacts of climate change, the health effects of air pollution (which Jacobson stated kills 2.5 to 4 million people worldwide each year based on estimates of the World Health Organization), and the risk that rising fossil fuel prices lead to economic, social, and political instability.
4. While often considered to be cleaner than current fossil fuel energy technologies, some non-WWS energy technologies may themselves present significant adverse climate, environmental, and/or health effects, as compared to WWS sources. According to Jacobson, these “not recommended” fuel sources include natural gas, “clean coal” with carbon capture, nuclear, soy/algae biodiesel, and ethanol (corn, cellulosic, sugarcane).
5. Jacobson illustrated the land use impacts of a 100% WWS scenario for California. In this example scenario, existing WWS sources would be retained, with improved efficiency. New WWS sources to replace existing non-WWS sources would be a mix of 35% from wind, 55% from solar, and 10% from other sources (geothermal, hydro,² tidal, wave). The footprint of the total energy supply portfolio in this scenario would be less than 1% of the state’s land area (or ~2.7% including the open space between wind turbines). This scenario would require tens of thousands of new on- and offshore wind turbines, millions of residential roof photovoltaic (PV) systems, several thousand large-scale solar plants, and a number of geothermal, hydro, tidal, and wave plants and devices.
6. While the intermittent nature of renewables is sometimes cited as a barrier to high levels of renewable electricity integration, Jacobson stated that over 99.8% of California’s energy needs can be supplied from WWS (without over-sizing) using real-time demand-response or energy storage to match power generation to daily and time-of-day demand.

¹ “All purposes” as used here refers to electricity, transportation, building heating and cooling, and industry. For more details and the illustrative plans developed by Professor Jacobson and his collaborators for California and other states, see www.thesolutionsproject.org.

² The scenarios assume that existing large hydro supplies would remain in place.

7. According to Jacobson, WWS energy technologies are in many cases cost-competitive with conventional sources today when life-cycle costs are considered. Including a conservative estimate of fossil fuels' negative externalities would make WWS sources even more cost effective. By 2020-2030, WWS sources will be less expensive than conventional supplies, even without accounting for externalities.
8. Jacobson also spoke about using excess electricity to generate hydrogen as an energy storage mechanism. Energy storage is a key element in the use of renewable power.

Dr. Jim Williams

1. California's climate goals include the AB 32 requirement to reduce statewide GHGs to 1990 levels by 2020, along with the goal of reducing GHGs to 80% below 1990 levels by 2050 (Executive Order S-3-05).
2. Beyond 2020, Williams believes the California policy approach is likely to follow a similar framework to AB 32, but a transformation of the energy system is required to meet the 2050 goal. Williams identified three primary strategies related to energy:
 - a. Reduce energy use through efficiency (in buildings and vehicles) and smart growth. Examples include the retrofit of the majority of existing homes over the next 20 years and achieving "zero net energy" in all new homes beginning in 2020.
 - b. Decarbonize both electricity and transportation fuels. The state's loading order³ may need to be modified to integrate greater concentrations of renewables. However, Williams stated that some low carbon electricity resources will still be needed to maintain grid reliability.
 - c. Electrification of transportation, building heating/cooling and industrial processes. Over the next 20 years, examples include the replacement of 70% of gasoline and diesel light-duty vehicles with EVs or PHEVs, as well as the replacement of 75% of existing gas water heaters with electric heat pump water heaters.
3. The scale of up-front investment needed statewide by 2050 is quite large,⁴ but variability in fossil fuel costs also presents a cost risk for inaction. Decarbonization and electrification will shift the energy economy to be dominated by fixed (capital) costs rather than variable (fuel) costs. In addition, there will be co-benefits (climate, health, etc.) that come with this shift.
4. The extent of the transformation requires solutions to a variety of technical and planning challenges. In addition, achieving these goals will require better coordination across state and regional agencies and sectors that have typically operated in silos, as well as the establishment of clear GHG mandates to guide the actions of each agency.

³ The loading order defines the priority that utilities must assign to different types of electric supply, with efficiency and demand response coming first, followed by renewables and then other supplies.

⁴ There is a large uncertainty in both technology costs and fuel costs, but the net cost increase could be on the order of ~\$500 billion by 2050. The cost estimates presented did not provide a value for the co-benefits (reduced externalities) of shifting away from polluting fuels.

5. Of particular note for the District, as transportation is electrified, emissions from the transportation sector (regulated by the State) will shift more and more toward stationary sources (regulated by the District).
6. Williams argued that public support and politics are bigger obstacles than technical abilities in reducing our GHG emissions for the future.

KEY EMERGING ISSUES

1. Further definition of the Bay Area's role. Further investigation is needed to identify, evaluate, and prioritize policies and measures that the District and other regional agencies can implement to support and advance attainment of the District's 2050 GHG reduction goals. Policies and measures need to be developed that are effective, efficient, and feasible, and they need to be coordinated across agencies, accounting for each agency's mission and authorities.
2. Further evaluation of the District's role. To achieve 2050 GHG reduction goals, a fundamental transition in energy sources and usage will need to be made across California and thus the Bay Area. This transition affects a number of areas that are within the District's ability to regulate, as well as other areas that are outside the District's current authority. Further evaluation of the District's evolving role is needed, including its authority and capacity to regulate and/or permit stationary sources that emit GHGs (with a long-range goal of reducing use of carbon fuels and their impacts on climate, air quality, and public health), influence indirect GHG emissions associated with energy consumed within the District, continue to educate the public, and coordinate with other agencies or expand its role in areas that the District has not traditionally pursued, including:
 - a. Energy efficiency (e.g., codes, financing, retrofits)
 - b. Energy use (e.g., choice of supply, rates, reliability)
 - c. Energy generation (e.g., distributed energy, on-site renewable, CCS)
 - d. Sources of energy use and emissions in buildings (e.g., water heaters, furnaces)
 - e. Planning (e.g., zoning, density, infill)
 - f. Transit (e.g., mode shifting, biking, walkable cities)
 - g. Vehicles and goods movement (e.g., infrastructure, consumer choices, technology development)
 - h. Non-energy/non-CO₂ GHGs (e.g., methane, HFCs, SF₆)
 - i. Waste (e.g., waste management, landfill gases)
 - j. Agriculture (e.g., animal feedlots, agricultural tillage, forestry)
 - k. Tailpipe emissions from vehicles
 - l. Upstream/life-cycle impacts (e.g., emissions over life cycle, not just in the District)
 - m. Water (e.g., use, pumping, efficiency)
 - n. Climate change adaptation
 - o. Carbon sequestration
 - p. Parks and public lands
3. Decarbonization of energy used in the District. For the Bay Area to achieve long-term climate goals in the energy sector, a fundamental transition must be made to lower per capita GHG

emissions. Although it will require cooperation and coordination with the California Public Utilities Commission (CPUC) and California Energy Commission (CEC), further investigation is needed in the District to develop and deploy major improvements in energy efficiency in all sectors, including transportation. Attainment of the District's 2050 GHG reduction goals will require more than just energy efficiency. Energy supply will need to be decarbonized, and energy demand will need to be supplied through low and no-carbon resources. How this will be done -- what policy choices, regulatory approaches, technology developments, and implementation measures will be needed -- is a major and critically important emerging issue. Further investigation is needed to identify, develop, and deploy measures to reduce the carbon intensity of energy (imported and produced within the Bay Area) used in residential, commercial, and industrial applications, as well as in the transportation sector.

4. Resiliency. Further investigation is needed to better understand how the shift to low-carbon energy supply and demand might help insulate California from the worst impacts of climate change, including drought, reduced snow pack, sea level rise, heat waves, and energy price volatility.
5. Grid reliability. Further investigation is needed to identify means by which grid reliability and back-up power generation can be ensured while also transitioning from fossil fuels to low carbon energy sources. Zero (or minimum) emission energy source dispatching strategies and tools for implementing those strategies need to be developed, demonstrated, and deployed.
6. Financing availability. Further investigation is needed to identify, evaluate, and demonstrate the availability and feasibility of mechanisms necessary to finance the measures required to achieve the District's 2050 GHG reduction goals, including additional innovative financing measures that provide benefits for all interested stakeholders.

RECOMMENDATIONS

Based on information presented at the February 13, 2014 meeting of the Advisory Council, as well as member input, the Advisory Council offers the following preliminary draft recommendations for further discussion and consideration throughout 2014. It is the intent of the Council to revisit these recommendations throughout the year, modifying them if appropriate as additional information and input is received.

1. Planning. We recommend that the District consider joining together with other state, regional, and local agencies in a collaborative regional effort to plan for, facilitate, and coordinate energy-related response actions to assist in achieving the Bay Area's share of California's target of 80 percent reductions in GHG emissions by 2050.
 - a. Coordinated multi-agency planning could assist in further defining agency roles and authorities, helping to identify and prioritize cross- and interagency energy supply response options, based on a combination of climate, air quality, public health, water, economic, and other factors.
 - b. Planning could include core principles such as the following:

- i. Greater electrification of energy use across all sectors, including transportation, is expected to occur.
 - ii. Lower-carbon energy sources could be further encouraged where electrification is not feasible.
 - iii. Greater decarbonization of electricity supply is expected to occur, resulting in an increasing shift from reliance on fossil fuels to renewable sources.
 - iv. Diversification of energy sources, biological resources, and economic investments is expected to be necessary and lead to strength, sustainability, and stability in each area.
 - v. All key externalities (e.g., climate, air quality, health, water) should be considered, not just dollar cost.
 - c. The District could further integrate its share of high-priority energy supply response actions into:
 - i. District air quality and climate planning efforts, including the District's multi-pollutant planning approach.
 - ii. The District's regulatory, permitting, and other programs.
 - iii. The District's CEQA guidelines.
2. Coordination. We recommend that the District encourage and support legislative and other efforts if needed to provide responsible planning agencies, including the District, with additional statutory and regulatory authorities and resources to coordinate and implement Bay Area energy-related response actions.
3. Grants. We recommend that the District, as appropriate within its mission and statutory authorities, consider incorporation into its grant programs criteria that further incentivize:
 - a. Development of infrastructure to support electrification (e.g., EV charging stations, solar PV, electrical heating and cooling), including enhancement of incentives for residents and building owners.
 - b. Clean-energy backup emergency power systems, rather than diesel/gasoline generators, at both individual building and community levels.
 - c. Promotion of energy efficiency measures in buildings, appliances, and processes, considering building performance, potential unintended adverse health consequences, and measures to minimize such consequences.
4. Education. We recommend that the District consider:
 - a. Integration into its public education programs further recognition of energy choices and their public health, air quality, and climate benefits.
 - b. Development of outreach strategies that further stress economic, health, and resiliency co-benefits of a shift to a low-carbon economy, and that use bottom-line metrics that best appeal to issues about which people care most (e.g., personal and family health and cost).

5. Operations. We recommend that the District consider as appropriate further steps to reduce the carbon footprint of its operations and facilities.

GLOSSARY

Carbon intensity – The average emission rate of grams of carbon dioxide released per unit of energy produced.

CCS (Carbon Capture and Sequestration) – The process of trapping carbon dioxide at its emission source, transporting it to a usually underground storage location, and isolating it there.

Cellulosic ethanol – Ethanol produced from biomass of various kinds, including waste from urban, agricultural, and forestry sources.

Clean coal with carbon capture – see CCS, above.

Decarbonization – The declining average fossil carbon footprint of primary energy over time.

Electrification – To supply (a region, community, building, etc.) with electric power.

Energy source dispatching strategies – Strategies for controlling energy flows to “the grid” from numerous energy sources (such as a combination of wind, water and solar) to balance the temporally-variable availability of each source with the total overall energy demand.

EV – Electric Vehicle

Externalities – External effects, often unforeseen or unintended, accompanying a process or activity.

GHG (Greenhouse Gases) – A gas in an atmosphere that absorbs and emits radiation within the thermal infrared range. This process is the fundamental cause of the greenhouse effect. The primary greenhouse gases in the Earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide, and ozone. Other greenhouse gases include hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆).

HFC (Hydrofluorocarbon) – A suggested replacement for the chlorofluorocarbon (CFC) coolant gas used in chillers and air conditioners.

Low-carbon – Minimal output of greenhouse gas (GHG) emissions.

PHEV (Plug-in Hybrid Electric Vehicle) – A hybrid vehicle which utilizes rechargeable batteries, or another energy storage device, that can be restored to full charge by connecting a plug to an external electric power source (usually a normal electric wall socket).

PV (Photovoltaic) – Producing electric current or voltage caused by electromagnetic radiation, especially visible light from the sun.

SF₆ (Sulfur hexafluoride) – An inorganic, colorless, odorless, non-flammable, extremely potent greenhouse gas which is an excellent electrical insulator.

Soy/algae biodiesel – Biodiesel refers to a vegetable oil- or animal fat-based diesel fuel consisting of long-chain alkyl (methyl, ethyl, or propyl) esters. Biodiesel is typically made by chemically reacting lipids (e.g., vegetable oil, animal fat) with an alcohol producing fatty acid esters. Biodiesel is meant to be used in standard diesel engines and is thus distinct from the vegetable and waste oils used to fuel converted diesel engines. Biodiesel can be used alone, or blended with petrodiesel in any proportions. Biodiesel can also be used as a low carbon alternative to heating oil. A variety of oils can be used to produce biodiesel. These include algae, which can be grown using waste materials such as sewage and without displacing land currently used for food production.

Zero-carbon – Zero output of greenhouse gas (GHG) emissions.

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Memorandum

To: Chairperson Sam Altshuler and Members
of the Advisory Council

From: Jack P. Broadbent
Executive Officer/Air Pollution Control Officer

Date: May 15, 2014

Re: Discussion of Draft Report on the Advisory Council Meeting on May 14, 2014

The attached draft report of the May 14, 2014, Advisory Council Meeting on *The Path Forward for the Energy Sector to Move Towards the 2050 Greenhouse Gas Goals* will be discussed with Air District staff, and the Council will finalize the recommendations at its meeting on July 9, 2014.

Respectfully submitted,

Jack P. Broadbent
Executive Officer/APCO

Prepared by: Sean Gallagher

Attachment

**REPORT ON THE ADVISORY COUNCIL ACTIVITIES IN MAY-JULY
CALIFORNIA'S ENERGY FUTURE AND THE MOVE TOWARDS THE 2050
GREENHOUSE GAS (GHG) GOAL**

EXECUTIVE SUMMARY

This report summarizes the ongoing activities of the Advisory Council during May-July 2014, consolidating presentations received, and subsequent discussion and consideration by Council members during this period. This report is also informed by, and should be reviewed in tandem with, the Advisory Council's May 2014 report.

The following presentations were made at the May 14, 2014 Advisory Council meeting:

1. *California's Energy Future* by Jane C.S. Long, Ph.D., Contributing Scientist at the Environmental Defense Fund, Former Principal Associate Director at Large and Director of Energy and Environment at the Lawrence Livermore National Laboratory.
2. *Reducing GHG Emissions through Energy and Innovation* by Emilio Camacho, Esq., Advisor to the California Energy Commissioner Hochschild and former Attorney with the Office of the Legislative Council.

A video recording of these presentations and the Council's discussion can be viewed at: <http://baaqmd.gov/The-Air-District/Board-of-Directors/Advisory-Council/Agendas-and-Minutes.aspx>.

Dr. Long and Mr. Camacho concurred with earlier presenters who emphasized that a multi-pronged strategy is required to reduce GHG emissions to sustainable levels. However, immediate action is required and it may not be possible to meet 2050 statewide GHG reduction goals (80% below 1990 levels) without significant advancement and deployment of new technologies. Furthermore, there appears to be a regulatory gap at the regional level that, if filled, could lead the region in developing and implementing an effective GHG action plan.

The recommendations to the Air District contained in this report emphasize the necessity for immediate action through all possible means, promote regional coordination towards the shared goal of reduced GHG emissions, seek to close regulatory gaps, and make progress in reducing GHG emissions through grant incentives and piloting of emerging technologies.

BACKGROUND

Professor Jane C.S. Long

1. Dr. Long explained the importance of stabilizing GHG emissions by highlighting the "bathtub effect." The bathtub effect is an analogy used to describe GHGs being added to the atmosphere at a much higher rate than they are decaying or being absorbed, much like

a bathtub with an open faucet and a clogged drain. Atmospheric concentrations will continue to increase until emissions are brought into equilibrium with the rate of decay and absorption. Even after equilibrium is achieved, atmospheric carbon dioxide (CO₂) concentrations will remain high because CO₂ remains in the atmosphere for centuries after it is emitted. The timeframe for returning to pre-industrial concentration levels is further extended by the sink of CO₂ that is dissolved in the ocean. CO₂ in the ocean will come out of solution and enter the atmosphere as atmospheric concentrations of CO₂ decrease.

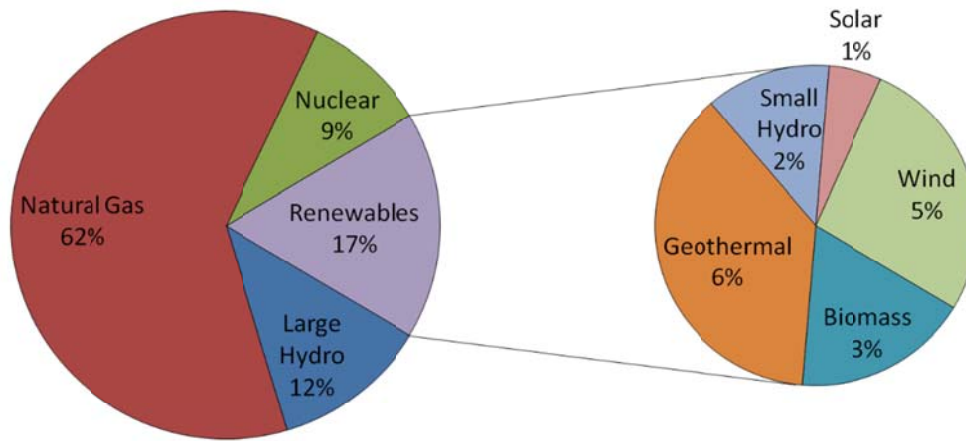
2. Dr. Long favors regional strategies to meet the State's long-term goal of reducing GHG emissions by 80% below 1990 levels by 2050 because the regional scale is large enough to achieve a meaningful impact through collaboration among local governments, yet small enough to allow political consensus to be built around a meaningful action plan. Multiple communities with similar strategies tend to build momentum to affect change at the state or federal levels. However at the regional level, especially in the San Francisco Bay Area, there does not appear to be an appropriate regulatory agency with authority to develop and implement actions that could be identified in a regional strategy.
3. Dr. Long identified three rules to follow when developing a GHG action plan:
 - a. When accounting for GHG emissions identify and quantify every emission source once and do not double-count emissions.
 - b. Action plans should reflect feasible technologies rather than unproven concepts that may never materialize.
 - c. Ensure action plans do not result in "Leakage." Leakage is a term that denotes the increase in GHG emissions elsewhere as a direct result of one action plan's reduction measures. For example, action plans that limit growth as a strategy to reduce local GHG emissions could result in increased emissions outside of that plan's boundaries.
4. Achieving the 2050 goal of an 80% reduction in GHG emissions relative to 1990 levels requires a four-part action plan that includes all of the following: (1) energy efficiency, particularly for end uses that cannot be easily electrified; (2) electrification of all feasible fossil fuel-based end uses; (3) decarbonization of the electricity supply; and (4) conversion to low-carbon combustion fuels (e.g., biofuels) for end uses that cannot be electrified (e.g., freight transportation, shipping, and air travel).
5. Dr. Long described several strategies to lower GHG emissions from energy use, for which she outlined advantages, disadvantages, and/or unknowns:

- a. Biomass/biofuels (e.g., woody energy crops, animal waste, municipal wastewater) were discussed as a potential energy source, both as a bridge fuel and as a fuel for decarbonizing fuels for end uses that cannot be converted to electricity. Other externalities need to be considered when formulating policy, including health effects of airborne pollutants, effects to food systems, etc.
 - b. According to Dr. Long, nuclear electricity is the second safest form of electricity, the cost estimate is similar to fossil/Carbon Capture and Storage (CCS) and renewables, and there are no technical barriers to the technology; however, construction of new facilities is currently illegal in California and public acceptance is low.
 - c. CCS was identified as a technology to capture CO₂ for use as a product. Though CCS generates CO₂ emissions, it converts CO₂ into a commodity.
 - d. Renewable energy is largely intermittent and cannot be stored on a large scale. “Load balancing” of renewable energy, which reduces the energy’s intermittence, may be ideal for industry, as the storage technology is still largely small-scale and not available for the entire grid.
 - e. Industrial Ecology is a promising strategy for reducing GHG emissions. Industrial ecology refers to a systems-based approach to managing industrial material flows so that one industry’s waste can be repurposed as a resource for another industry’s inputs. It seeks to ‘close the loop’ between inputs and outputs, much like natural systems do, thus reducing environmental impact and pollution.
6. Success in attaining the GHG reduction goal hinges on quickly deciding on and implementing systems that eliminate emissions while also considering cost. Research from the California Council on Science and Technology indicates that California can reduce GHG emissions by about 60% below 1990 levels by 2050. Achieving this goal is challenging, but possible if existing technology is used without regard to cost, non-commercial technology is deployed and deployment takes place at an ‘unprecedented rate.’ Achieving an 80% reduction in GHG emissions is unlikely without significant new technology innovation and deployment.
 7. Business models for the utility industry conflict with many strategies to achieve GHG reduction. The most egregious conflict is for natural gas utilities that depend on continued CO₂ emissions from gas combustion to generate profits for their shareholders. Electric utility business models can also encounter conflicts with GHG reduction goals if the utilities underprice their load balancing services.

Emilio Camacho

1. California is a leader in renewable energy deployment. California is home to the world’s largest solar, wind, and geothermal projects. As shown in Figure 1, below, renewable energy sources account for approximately 17% of all in-state electricity generated in 2012.

Figure 1. California In-State Electricity Generation in 2012



Sources: California Energy Commission, QFER and SB 1305 Reporting Requirements. In-state generation is reported generation from units 1 MW and larger.

2. Reducing GHGs in the energy sector is a goal of the California Energy Commission (CEC). Camacho highlighted multiple areas in which the CEC is providing leadership. The CEC sets energy efficiency standards for buildings and appliances; it permits new power plants, including large-scale photovoltaic (PV), solar thermal, wind, and geothermal power; it funds research and development of emerging technologies related to energy efficiency, renewable energy, energy storage, and load balancing (e.g., smart grid and demand response technologies).
3. As per Comacho, reducing GHGs in the energy sector requires altering consumer behavior, increasing the efficiency of energy production, electrification of end uses, encouraging renewable energy sources, developing and increasing energy storage options, use of biofuels, research and development, integration of resources and new technologies and through grid alternatives. The way to achieve this is through policy change.
4. Integration of new technology offer opportunities for reducing GHG emissions. For example, microgrids are modern, small-scale versions of the centralized electricity

system. Microgrids generate, distribute, and regulate the flow of electricity to consumers, but do so locally and can be used to integrate renewable energy into the electricity system at the community level.

KEY EMERGING ISSUES

The “bathtub effect” highlights the necessity to immediately implement all viable low-GHG energy sources. It is essential to reduce emissions as much as possible and quickly to achieve equilibrium. Relying on new systems and infrastructure (such as new wind, water, and solar projects) raises questions about how fast a replacement energy supply system could be built. Strategies to replace existing fossil-fuels will need to consider the build out of replacement systems.

Dr. Long parts ways with Dr. Jacobson on the issue of load balancing. Dr. Jacobson argued that virtually 100% of California’s electricity needs can be met through “WWS”-a combination of wind, hydropower (water), and solar-without over-sizing the capacity of WWS systems. This finding enabled Dr. Jacobson to recommend against low-GHG energy sources such as nuclear and coal that may produce significant negative externalities. Dr. Long, on the other hand, argued that the low load factors for wind and solar (30-40%) present tremendous load balancing challenges that cannot be met with a WWS-only strategy. The current load balancing strategy using gas turbines would produce emissions that far exceed 2050 targets. Currently available energy storage technologies would be cost-prohibitive. Load balancing using flexible loads would require investments in either supply infrastructure or demand infrastructure that would then sit idle much of the time.

The load balancing challenge leads Dr. Long to argue for an “all of the above” approach; all viable low-GHG energy sources must be given serious consideration, including fossil fuels with CCS, biomass, and nuclear. Biofuels are particularly important as a strategy for supplying fuel to end uses that cannot feasibly be electrified. When paired with biofuels, CCS offers the advantage of being GHG-negative. Although nuclear energy may be politically infeasible, Dr. Long argues that proven storage technologies are already available. Storage and related safety issues might also become less of a concern with Generation IV¹ reactors under development.

¹ Generation IV refers to the development of innovative nuclear systems (reactors and fuel cycles) likely to reach technical maturity by 2030. Under the Generation IV International Forum (GIF), six nuclear systems were selected with the aim of making considerable improvements in economic competitiveness, safety, uranium resource economy and in reducing long-life radioactive waste.

Camacho's presentation highlights the CEC's leadership role in energy efficiency, decarbonization of the energy supply, and load balancing but it is largely silent on the issue of electrifying fossil fuel-based end uses. Electrification of the millions of small stationary sources of CO₂ (e.g., gas furnaces, water heaters, and clothes dryers) is complicated by the fact that no agency has regulatory authority over the CO₂ emissions from these sources.

RECOMMENDATIONS

The Advisory Council recommends the following updates and additions to the recommendations in the May 2014 report:

1. Planning. Given the "bathtub effect" of GHG emissions into the atmosphere, it is urgent to significantly reduce GHGs by mid-century or sooner. We recommend that the District, through regulations, permitting, guidelines, and other planning approaches, support decarbonization of energy supplies and electrification of energy use across all sectors. For those end uses where fossil fuel substitutes are not feasible or reasonably cost-effective, lower-carbon energy sources (such as biofuels) plus energy efficiency efforts should be encouraged. All efforts should be made to implement strategies that reduce GHG emissions while also limiting the negative externalities. The District should work with State, local, and other entities of regional government to develop a long-term strategic plan including regional GHG reduction goals and a roadmap for meeting them by 2050.
2. Regulatory Authority. We recommend that the District pursue advocacy efforts to resolve the lack of regulatory authority over small stationary sources of CO₂ emissions. These end uses are unlikely to be electrified on a large scale unless regulatory requirements dictate a steady reduction in CO₂ emissions from these sources. There are multiple options for assigning this regulatory authority, including vesting it with the regional Air Districts; assigning it to local governments as part of their building permitting function; or assigning it to the CEC as part of its ability to set appliance standards.
3. Regional Coordination. Because of the efficacy of climate action planning at the regional scale, we recommend that the District use the full extent of its statutory and regulatory authorities and resources to coordinate and implement Bay Area energy-related response actions, and to execute its long-term strategic plan. We recommend that the District identify any barriers that prevent it from taking effective and meaningful regional action, including identifying additional authority or powers that may be needed by the District or other State, regional, or local government agencies. To ensure successful implementation of the District's long-term GHG plan, we recommend the District solicit support from partnering agencies (e.g., Planning Departments, Offices of Sustainability, and local government officials).
4. Grants. The District should prioritize the following within its grant programs:

- a. Development of infrastructure to support electrification (e.g., electric vehicle charging stations, solar PVs, electric heating and cooling), including enhancement of incentives for residents and building owners.
 - b. Clean-energy backup emergency power systems, rather than diesel/gasoline generators, at both individual building and community levels.
 - c. Promotion of energy efficiency measures in buildings, appliances, and processes, considering building performance, potential unintended adverse health consequences, and measures to minimize such consequences.
 - d. Local government climate action planning that incorporates a multi-pollutant emissions reduction approach.
 - e. Promotion of strategies to reduce vehicle miles travelled and land use planning to reduce increased GHG emissions from growth.
5. Emerging technologies. We recommend that the District research the feasibility of emerging technologies and partnerships that could accelerate efforts toward GHG reduction, and which the Bay Area could pilot and eventually implement, such as: industrial ecology, use of biofuel resources such as landfill gas and agricultural waste, municipal solid waste gasification, CCS, ‘smart grid’/ ‘microgrid’ technologies and zero-emission load-balancing strategies to better accommodate renewable energy sources.

GLOSSARY

Bathtub effect –The bathtub effect is an analogy used to describe GHGs being added to the atmosphere at a much higher rate than they are decaying or being absorbed, much like a bathtub with an open faucet and a clogged drain.

Biofuel – A biofuel is a fuel that contains energy from geologically recent carbon fixation. These fuels are produced from living organisms. These fuels are made by a biomass conversion (biomass refers to recently living organisms, most often referring to plants or plant-derived materials). This biomass conversion can result in fuel in solid, liquid, or gas form. This new biomass can be used for biofuels.

CCS – (Carbon Capture and Storage or sometimes Carbon Capture and Sequestration) – The process of trapping carbon dioxide at its emission source, transporting it to a usually underground storage location, and isolating it there.

CEC – California Energy Commission

CO₂ – Carbon dioxide

Decarbonization – The declining average carbon intensity of primary energy over time.

District – Bay Area Air Quality Management District

GHG – (Greenhouse Gases) – A gas in an atmosphere that absorbs and emits radiation within the thermal infrared range. This process is the fundamental cause of the greenhouse effect. The primary greenhouse gases in the Earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide, and ozone. Other greenhouse gases include hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆).

Generation IV nuclear reactors – Generation IV refers to the development of innovative nuclear systems (reactors and fuel cycles) likely to reach technical maturity by 2030. Under the Generation IV International Forum (GIF), six nuclear systems were selected with the aim of making considerable improvements in economic competitiveness, safety, uranium resource economy and in reducing long-life radioactive waste.

Industrial Ecology – Industrial ecology refers to a systems-based approach to managing industrial material flows so that one industry's waste can be repurposed as a resource for another industry's inputs.

Leakage – Leakage is a term that denotes the increase in GHG emissions elsewhere as a direct result of one action plan's reduction measures.

Load balancing – Load balancing refers to the use of various techniques by electrical power stations to store excess electrical power during low demand periods for release as demand rises.

Low-carbon – Minimal output of greenhouse gas emissions.

Microgrid – a modern small-scale version of the centralized electricity system.

PV – (Photovoltaic) – Producing electric current or voltage caused by electromagnetic radiation, especially visible light from the sun.

WWS – Wind, Water, Solar