BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

ADVISORY COUNCIL
TECHNICAL COMMITTEE

AGENDA

COMMITTEE MEMBERS

KRAIG KURUCZ, CHAIRPERSON
SAM ALTSHULER, P.E.
LOUISE BEDSWORTH, PH.D.
ROBERT BORNSTEIN, PH.D.
JOHN HOLTZCLAW, PH.D.
FRED GLUECK

MONDAY
FEBRUARY 11, 2008
9:30 A.M.

7TH FLOOR BOARD ROOM

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 of August 6, 2007 and October 1, 2007**

4. **Update on PM Inventory Development, Modeling and Data Analysis**

   Mr. Saffet Tanrikulu, Research and Modeling Manager and Mr. David Fairley, Statistician; will provide an update on PM inventory development, modeling and data analysis.

5. **Discussion on Objectives for 2008**

   The Committee will discuss objectives for 2008.

6. 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. .

7. Time and Place of Next Meeting. 9:30 a.m., Monday, April 7, 2008, 939 Ellis Street, San Francisco, CA 94109.

8. Adjournment

CONTACT EXECUTIVE OFFICE - 939 ELLIS STREET SF, CA 94109

(415) 749-5127
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.

KK:vj

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

EXECUTIVE OFFICE:
MONTHLY CALENDAR OF DISTRICT MEETINGS

FEBRUARY 2008

TYPE OF MEETING	DAY	DATE	TIME	ROOM
Board of Directors Regular Meeting/ Retreat - *(Meets 1st & 3rd Wednesday of each Month)* **- CANCELLED**	**Wednesday**	**6**	**9:45 a.m.**	**Board Room**
Advisory Council Air Quality Planning Committee *(Meets 1st Thursday of each even Month)*	**Thursday**	**7**	**9:30 a.m.**	**Board Room**
Advisory Council Technical Committee - (*Meets 1st Monday of each even Month)*	**Monday**	**11**	**9:30 a.m.**	**Board Room**
Advisory Council Public Health Committee *(Meets 2nd Wednesday of each even Month)*	**Wednesday**	**13**	**1:30 p.m.**	**Room 716**
Board of Directors Public Outreach Committee *(Meets 1st Thursday every other Month)*	**Thursday**	**14**	**9:30 a.m.**	**4th Floor Conf. Room**
Joint Policy Committee	**Friday**	**15**	**10:00 a.m. – 12:00 p.m.**	**BCDC 50 California St., 26 Fl. San Francisco, CA**
Board of Directors Regular Meeting *(Meets 1st & 3rd Wednesday of each Month)*	**Wednesday**	**20**	**9:45 a.m.**	**Board Room**
Board of Directors Legislative Committee *(Meets 4th Monday of every Month)*	**Monday**	**25**	**9:30 a.m.**	**4th Floor Conf. Room**
Board of Directors Budget & Finance Committee - *(Meets 4th Wednesday of each month)*	**Wednesday**	**27**	**9:30 a.m.**	**4th Floor Conf. Room**
Board of Directors Mobile Source Committee – *(Meets 4th Thursday of each Month)*	**Thursday**	**28**	**9:30 a.m.**	**4th Floor Conf. Room**

MARCH 2008

TYPE OF MEETING	DAY	DATE	TIME	ROOM
Board of Directors Regular Meeting *(Meets 1st & 3rd Wednesday of each Month)*	**Wednesday**	**5**	**9:45 a.m.**	**Board Room**
Board of Directors Public Outreach Committee *(Meets 1st Thursday every other Month)*	**Thursday**	**6**	**9:30 a.m.**	**4th Floor Conf. Room**
Advisory Council Executive Committee ***(Meets 2nd Wednesday of every odd Month)***	**Wednesday**	**12**	**9:00 a.m.**	**Room 716**
Advisory Council Regular Meeting ***(Meets 2nd Wednesday of every odd Month)***	**Wednesday**	**12**	**10:00 a.m.**	**Board Room**

March 2008 Calendar Continued on Next Page

MARCH 2008

TYPE OF MEETING	DAY	DATE	TIME	ROOM
Board of Directors Stationary Source Committee *(Meets 3rd Monday Quarterly)*	**Monday**	**17**	**9:30 a.m.**	**Board Room**
Board of Directors Regular Meeting *(Meets 1st & 3rd Wednesday of each Month)*	**Wednesday**	**19**	**9:45 a.m.**	**Board Room**
Board of Directors Climate Protection Committee *(Meets 3rd Thursday every other Month)*	**Thursday**	**20**	**9:30 a.m.**	**4th Floor Conf. Room**
Joint Policy Committee	**Friday**	**21**	**10:00 a.m. – 12:00 p.m.**	**MTC 101 - 8th Street Oakland, CA 94607**
Board of Directors Legislative Committee *(Meets 4th Monday of every Month)*	**Monday**	**24**	**9:30 a.m.**	**4th Floor Conf. Room**
Board of Directors Budget & Finance Committee *(Meets 4th Wednesday of each month)*	**Wednesday**	**26**	**9:30 a.m.**	**4th Floor Conf. Room**
Board of Directors Mobile Source Committee *– (Meets 4th Thursday of each Month)*	**Thursday**	**27**	**9:30 a.m.**	**4th Floor Conf. Room**

APRIL 2008

TYPE OF MEETING	DAY	DATE	TIME	ROOM
Board of Directors Regular Meeting *(Meets 1st & 3rd Wednesday of each Month)*	**Wednesday**	**2**	**9:45 a.m.**	**Board Room**
Advisory Council Air Quality Planning Committee *(Meets 2nd Wednesday of each even Month)*	**Thursday**	**3**	**9:00 a.m.**	**Room 716**
Advisory Council Technical Committee - (*Meets1st Monday of each even Month)*	**Monday**	**7**	**9:30 a.m.**	**Board Room**
Advisory Council Public Health Committee *(Meets 2nd Wednesday of each even Month)*	**Wednesday**	**9**	**1:30 p.m.**	**Room 716**
Board of Directors Regular Meeting *(Meets 1st & 3rd Wednesday of each Month)*	**Wednesday**	**16**	**9:45 a.m.**	**Board Room**
Joint Policy Committee	**Friday**	**18**	**10:00 a.m. – 12:00 p.m.**	**BCDC 50 California St., 26 Fl. San Francisco, CA**
Board of Directors Budget & Finance Committee *(Meets 4th Wednesday of each month)*	**Wednesday**	**23**	**9:30 a.m.**	**4th Floor Conf. Room**
Board of Directors Mobile Source Committee *– (Meets 4th Thursday of each Month)*	**Thursday**	**24**	**9:30 a.m.**	**4th Floor Conf. Room**
Board of Directors Legislative Committee *(Meets 4th Monday of every Month)*	**Monday**	**28**	**9:30 a.m.**	**4th Floor Conf. Room**

vj
1/31/08 (1:37 p.m.)
P/Library/Forms/Calendar/Calendar/Moncal

AGENDA: 3

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

DRAFT MINUTES

Advisory Council Technical Committee
9:00 a.m., Monday, August 6, 2007

1. **Call to Order:** Chairperson Sam Altshuler, P.E., called the meeting to order at 9:05 a.m.

   Roll Call: Sam Altshuler, P.E., Chairperson, Louise Bedsworth, Ph.D., Robert Bornstein, Ph.D., John Holtzclaw, Ph.D., and Kraig Kurucz.

   Absent: William Hanna.

2. **Public Comment Period.** There were no public comments.

3. **Approval of Minutes of April 16, 2007.** The Committee provided minor revisions to the minutes that will be incorporated into the final version. Dr. Holtzclaw moved approval of the minutes; seconded by Dr. Bedsworth; the draft minutes were approved unanimously.

   Approval of Minutes June 11, 2007. The Committee provided a number of revisions to the minutes that will be incorporated into the final version. Mr. Kurucz moved approval of the minutes; seconded by Dr. Holtzclaw; the draft minutes were approved unanimously.

4. **Presentation on "Evaluating the use of Ethanol and its Impact on Ozone and Public Health as well as an Update on Carbon and Climate Change":** *Dr. Mark Jacobson, Professor of Civil Environmental Engineering at Stanford University, presented to the Committee his recent work on evaluating the use of ethanol and its impact on ozone and public health as well as an update on carbon and climate change.*

   Chairperson Altshuler introduced Dr. Mark Jacobson of Stanford University stating that Dr. Jacobson met with the Committee 4-5 years ago with a presentation on Black Carbon. Dr. Jacobson recently published an article on "Ethanol and Implications in Public Health," that was highly publicized. Mr. Altshuler thanked Dr. Jacobson for joining the Committee.

   Dr. Jacobson discussed 2 different studies one being the ethanol study and the other, the latest research on black carbon. In addition, Dr. Jacobson reviewed the various energy sources, to look at solutions to energy, climate and air pollution issues in California in general.

   Dr. Jacobson spoke on a larger scale of global warming and the causes of global warming. The following topics were discussed relative to global warming:

- Greenhouse Gases;
- Fossil-Fuel Soot Particles;
- Urban Heat Island;
- Cooling Practice; and
- Net Observed Global Warming

Dr. Jacobson stated that the net observed global warming since 1750 is about 0.7 degrees to 0.85 degrees kelvin. Numerical simulations of greenhouse gas impacts, versus particle impacts show that greenhouse gases cause about 1.5 to 1.6 degrees kelvin warming and soot particles from fossil fuel sources including diesel tractors, off-road equipment, and jet fuel are also included and cause about 0.3 degrees Kelvin decrease. Numerical simulations were run on a global scale coming from the sub-grid urban surfaces. The total warming components are about 1.9 kelvin from the simulations and then offset by particles that are causing cooling, which are non-soot particles, primarily, sulfates, nitrates, ammonia, and organic carbon that don't cause warming. These offset enough warming to cause the net observed change.

Dr. Jacobson noted that in no way, do we not want to control the particles because the health implications are so significant. "It really means that we have to control the greenhouse gases quickly as well." Dr. Holtzclaw asked what is the difference between the particle size and character. Dr. Jacobson's response referred to the slide entitled Fractal Soot Agglomerates (Arrows) Coated by Ammonium Sulfate, that shows numerical modeling. This slide depicts the size distribution of particles on a global scale and accounts for discrete size resolution from 1 nanometer up to 50 micron size particles. From diesel, that size distribution includes the lubricant oil for example, the soot mode, and also the larger soot for other components. The evolution of these particles with size over time, accounts for coagulation, condensation, and other types of internal mixing of chemistry on the particles, interaction of the particles with clouds, and with gases and the removal through rain out and wash out through cloud processing. It accounts for the composition of the particles as well. In each particle size there are several size distributions. There is an emitted soot size distribution. Then there is emission of other things and other size distributions. Each size distributions interact with each other. The soot itself is broken down into black carbon, primary organic carbon and secondary organic carbon. Then there are sulfates and nitrates, and ammonium and sodium chloride, potassium, calcium magnesium, etc.

Mr. Altshuler asked if this study has been published and Dr. Jacobson's response was that the fossil fuel soot component had been published in 2003.

Dr. Bedsworth asked about the current U.S. death rate for PM2.5. Dr. Jacobson's response was that the estimate is about 50,000 to 100,000 people die of air pollution each year. Ozone death from vehicles is about 6,000 to 10,000 people.

The most recent and updated study looking at the lifecycle assessment of ethanol emissions in terms of carbon effect is by Mark Delucci at U.C. Davis. Dr. Jacobson stated that Mr. Delucci has accounted for things that were never accounted for including land use change, and the carbon store to the land. Mr. Delucci looked at pollutants that were not included in previous studies, for example, soot.

Dr. Jacobson stated that when ethanol is produced from corn, there is considerable use of tractors burning diesel fuel in the farming operations. Since ethanol can not be transported in a pipeline (it absorbs water too easily), you need to transport it through trains, diesels tanker trucks, and barges. Not only is there a huge amount of petroleum carbon emitted, there is also emitted soot, which has a climate impact and a health impact. This was never accounted for in any of the previous carbon balance studies. The net result that Mr. Delucci found was that there is just a 2% difference in the net carbon from corn ethanol versus gasoline. Cars produced in the U.S. as a whole, about 25.8% of the carbon and Californian cars have a higher percent of about 35%. So there is a 2% benefit from corn ethanol and if you multiple that by 26%, you are down to about 0.62% which is the benefit of corn ethanol, with 100% conversion to E85.

Dr. Jacobson stated that wind electricity is 98% carbon free. If we use the wind for battery electric vehicles, there is a 25.5% benefit and the same applies for hydrogen fuel cell vehicles. Solar is about 90% carbon free, so there is a little less carbon benefit than wind. Solar energy is much more efficient to use than other technologies.

The land area needed to run all of the US vehicles on corn ethanol is an average of 15% of the entire U.S., including Alaska. Cellulosic ethanol needs an average of between 5% and 16% depending on the estimate. To run all the vehicles in the U.S. you would need about 70,000 to 120,000, five-megawatt wind turbines, as long as they are in the location where there is wind You need about 8 meters per second or faster of wind speed to get the adequate machine efficiencies. If there were plans to replace all the other carbon in the U.S. for coal and electricity with wind turbines alone, it would be take 120,000 to 160,000 turbines or 45,000 to 60,000 natural gas power plants.

In order to address global warming, there is a need to reduce carbon emissions by 80%.

Birds tend to play a significant factor when it comes to development of wind farms. This information includes:

- U.S. bird deaths from current wind turbines – 10,000-40,000/yr. (a)
- U.S. bird deaths from communication towers – 50 million/yr. (a)
- Worldwide bird deaths from avian flu – 200 million/yr. (b)
- Est. bird deaths with 2,500,000 turbines worldwide – 2.5-10 million/yr.
- Outdoor human deaths reduced by these turbines – 800,000/yr. (c)

Also noted was that the effect of wind turbines on birds will be small relative to the benefit of reducing fossil-biofuels on human and animal illness.

(a) Bird Conservancy (April 2006)
(b) San Jose Mercury News (April 2006)
(c) World Health Organization (2002)

Overall summary of the presentation included:

- Global warming will hasten as aerosol (non soot) pollution decreases.
- CO_2 increases air pollution mortality due to its effect on temperature, water vapor, and atmospheric stability, which increase ozone and particulate matter in urban areas.
- 80% reductions in current emissions are needed to stabilize CO_2. Corn ethanol cannot practically reduce CO_2 in the U.S. by more than 0.07-0.2%; cellulosic ethanol cannot reduce CO_2 by more than 1.3-4%, based on current understanding.
- Wind-battery electric vehicles can reduce U.S. CO_2 by 25.5%; solar-battery electric vehicles can reduce it by 23.4%. Wind turbines require 30 times less land than corn ethanol and 20 times less land than cellulosic ethanol for the same power.
- Sufficient wind and solar are available worldwide to supply all electric and non-electric energy needs simultaneously several times over.
- Converting all U.S. gasoline vehicles to ethanol (E85) vehicles will not improve air quality. At 100% penetration, it may enhance air pollution mortality from 0 to 200/yr deaths above the 10,000/yr. due to gasoline in 2020. At 10-30% penetration, deaths may still be 0 to 20-60/yr. above 10,000/yr.
- The long lifetime of unburned ethanol in the atmosphere may result in a global source of acetaldehyde and ozone.
- Each ethanol or gasoline vehicle developed from now on will enhance air pollution and climate problems significantly compared with each renewable-powered battery-electric or hydrogen fuel cell vehicle produced.
- More info: www.stanford.edu/group/efmh/jacobson/E85vWindSol

Dr. Jacobson concluded his presentation. Mr. Altshuler asked Dr. Jacobson about plug in hybrids, and wanted to know the next step in the analysis while looking at the vehicle to grid concepts of plug in vehicles, as well as the use of vehicles, as a storage mechanism for electricity. Dr. Jacobson replied that Mr. Willit Kempton, University of Delaware is looking at the vehicle to grid and that Mr. Kempton recently met with PG&E who are currently working on the same vehicle to grid program.

Dr. Bedsworth, noted that there are 2 issues with ethanol that are somewhat separate; one is the energy balance question which is how much energy do you put in and how much do get out, which is a separate question from the carbon question because of the source of energy.

Mr. Altshuler thanked the speaker for his time and efforts.

5. **Presentation on Ambient Methane Trends:** *Sam Altshuler presented information on ambient methane trends for discussion.*

Mr. Altshuler noted that he took measurements for ambient methane in the 1970s. He looked at the analyzers to see if they were operating properly with background, clean air. The analyzers read 1.4 to 1.6 parts per million clean air. He noted that recently he looked at the current data on the Air District website, and it showed 1.8 parts per million during baseline or clean air conditions.

Mr. Altshuler contacted David Fairley, Statistician, Research and Modeling Division to assist with trending data for methane within the Bay Area. Mr. Altshuler requested the lower methane values the 10% methane averages, which Mr. Fairley provided data that covered a span from 1981 to 2005. Mr. Altshuler generated a graph showing methane is indeed increasing, at a rate of 12.5% over the 25 years. Normalizing this to 100 years that would show an increase of 50% in methane for a century, this agrees very closely with a data point that was retrieved from the internet from an article by T.J. Blazeen and Carmen Smith. The report was published in July 2006, which showed a methane increase of 43% per century for the time period from 1750 to present.

To put things into perspective, the CO_2 increase from 1750 to current is estimated at 12% a year. This information is based on the data that were presented by Mr. Altshuler. Mr. Altshuler also noted that methane levels in the ambient seem to be rising at a greater rate than CO_2. Methane is 23 times more potent than CO_2, and even though it is at a much lower concentration than CO_2, Mr. Altshuler felt a need to shine light on this issue. Also noted, is that N_2O has risen 7% and tropospheric ozone 13%.

Mr. Altshuler asked the Committee how they should proceed to validate the simple trending that was conducted by Mr. Altshuler and not focus 100% of the Committee's efforts on CO_2. He suggested that maybe there is something concerning methane that the Committee should be aware of and potentially address for the District's benefit.

Mr. Kurucz asked about the percentage of the problem that it represents now; to see if it is growing from something insignificant, or is it already fairly significant and then growing at a faster rate. Mr. Altshuler indicated that if you normalize the methane to CO_2, (i.e. multiple the concentration by 23), that gives a CO_2 equivalent of 42 parts per million. Carbon Dioxide is 377 parts per million, so the methane is about a little more than 10% of the CO_2.

Dr. Bedsworth noted it would be interesting to know how this compares to other basins, particularly San Joaquin Valley, where there might be a different type of trend, an urban versus rural. Mr. Altshuler reiterated that this study was based on the lower limit of the methane, which is the background and that perhaps the background in San Joaquin Valley would differ than the coast line in the Bay Area.

Mr. Kurucz also suggested that staff indicate the other sources of methane, to show that this is not just a local problem. Mr. Kurucz noted that the Air Districts' actions may only be limited to local, but perhaps the general methane levels are driven more by the kind of activities that are here at the Air District.

Mr. Altshuler asked Dr. Jacobson if he agreed with the trending, and what has been observed with regard to the 50% increase in emissions in the next century. Dr. Jacobson agreed with Mr. Altshuler's findings, but was not certain about the last three years, but indicated that he has seen data showing global trends decreasing.

Action: Mr. Altshuler asked staff to look at the methane data a bit closer, as well as look at other metrics and conduct research to see if it catches the attention of staff. Mr. Wee noted that since the initial request went to staff informally, that he would have staff look at the information from Mr. Fairley and provide the Committee with more thorough research and look at other sources of methane data to put things in perspective.

6. **Committee Member Comments/Other Business.** Mr. Altshuler spoke briefly about the upcoming Advisory Council Executive Committee and Mr. Kurucz followed up with information on a book that he recently read about running an Advisory Council and one of the suggestions was not to organize along the lines of the organization itself. Also noted, was the way the Council is presently organized, each year at the retreat, once a decision is made on how issues are going to be resolved, virtually every issue is given to either 2 or 3 of the existing Committees, as there tends to be an overlap on virtually every topic.

   Dr. Bornstein suggested that the preparation of the minutes to be more logical and suggested the following:

   - Encourage speakers to include more descriptions in their technical discussions;
   - Point out to the speakers that minutes have to be taken, so that their summary could be very complete of all their main points, as the most important material is what the speaker considers is the summary of what was said;
   - Perhaps send minutes to the speaker and have the speaker look at it to see that the technical terms and ideas are captured; and
   - Handouts from the speaker should be submitted in color, because without the color all the information is lost.

   Mr. Altshuler suggested this issue also be presented at a future Advisory Council Executive Committee meeting.

7. **Time and Place of Next Meeting**. 10:00 a.m., Monday, October 1, 2007, 939 Ellis Street, San Francisco, CA 94109.

8. **Adjournment.** 11:50 a.m.

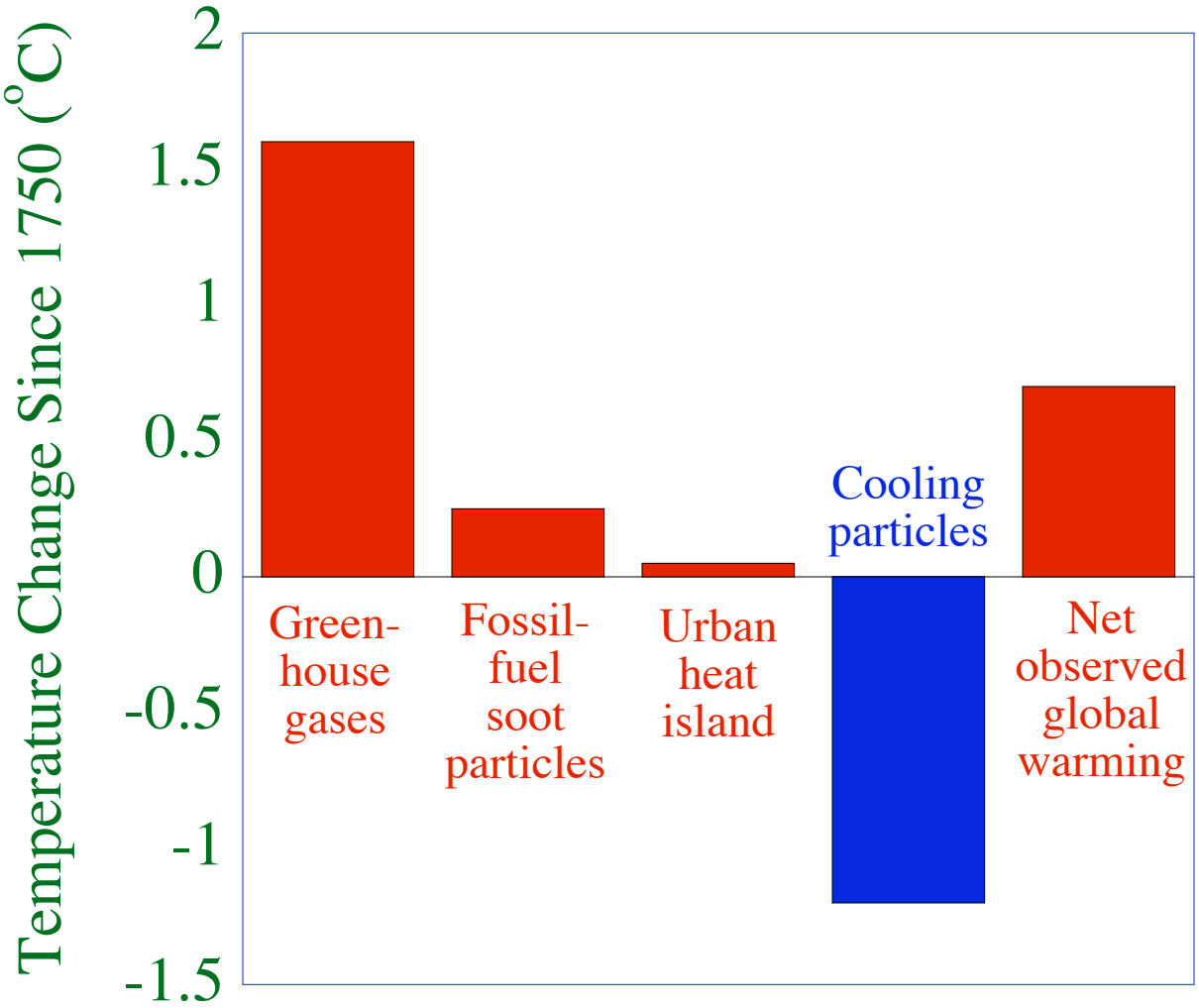
Vanessa Johnson
Executive Secretary

Evaluation of Proposed Solutions to Air Pollution / Global Warming

Mark Z. Jacobson
Atmosphere/Energy Program
Dept. of Civil & Environmental Engineering
Stanford University

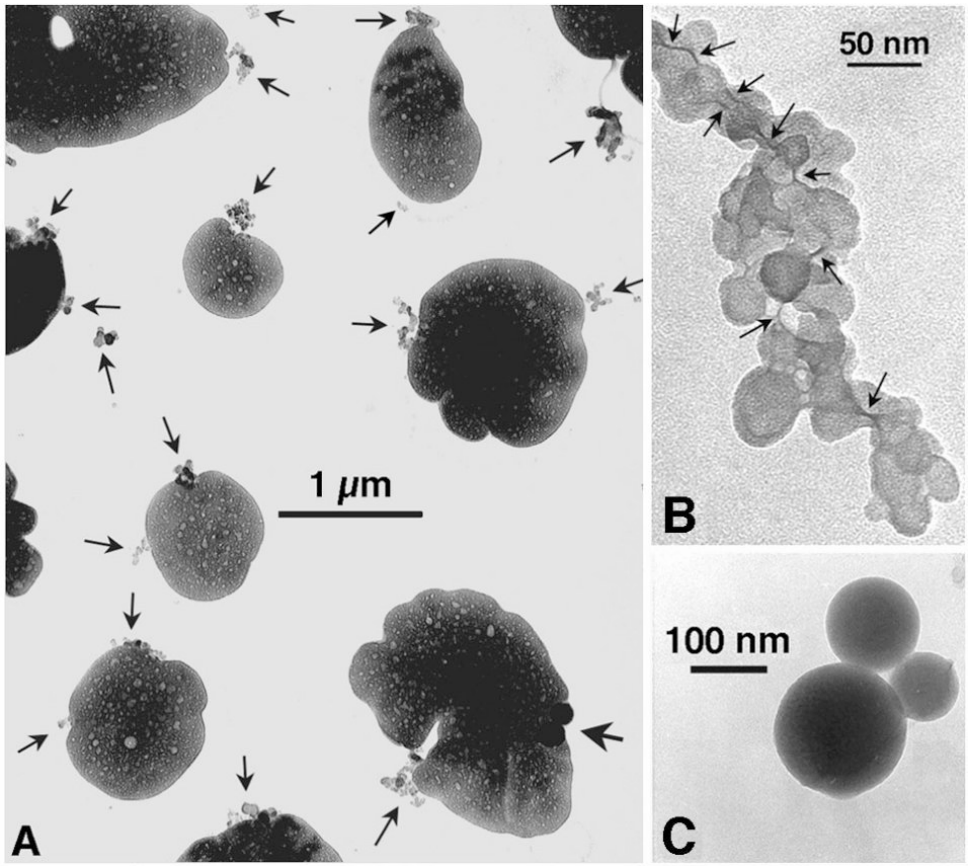
Bay Area Air Quality Management District
August 6, 2007

Causes of Global Warming



M.Z. Jacobson

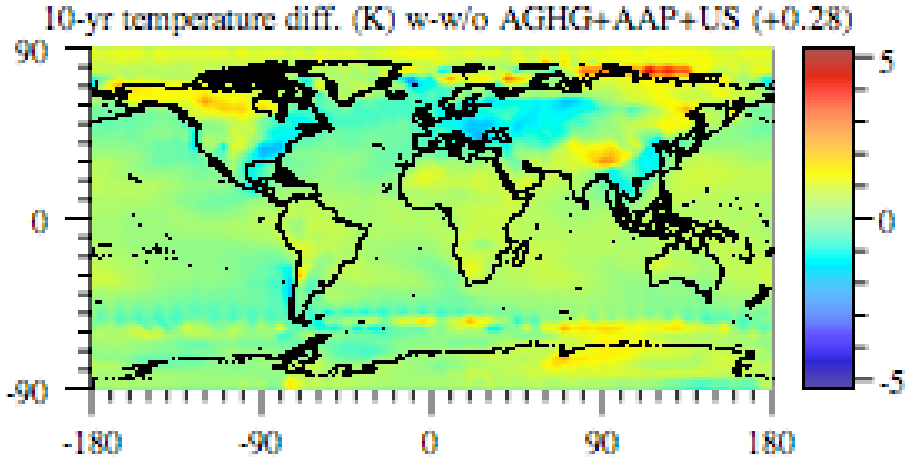
Fractal Soot Agglomerates (Arrows) Coated by Ammonium Sulfate



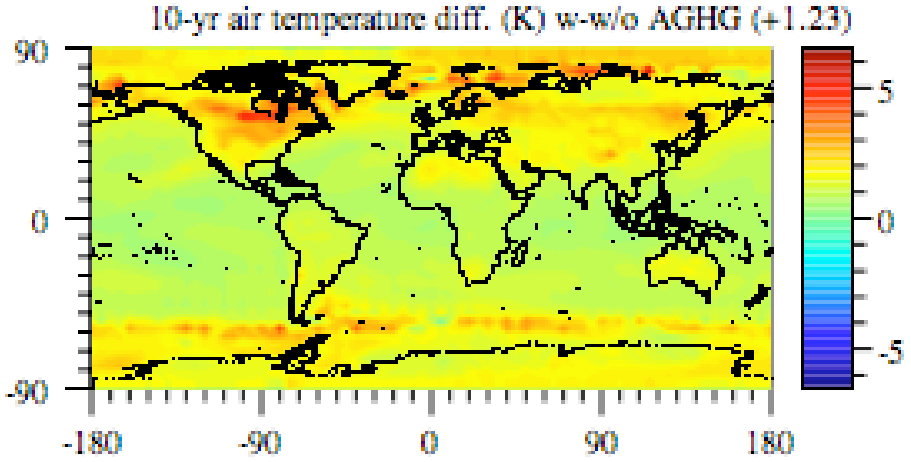
Pósfai et al. (1999)

10-yr Modeled Temperature Differences

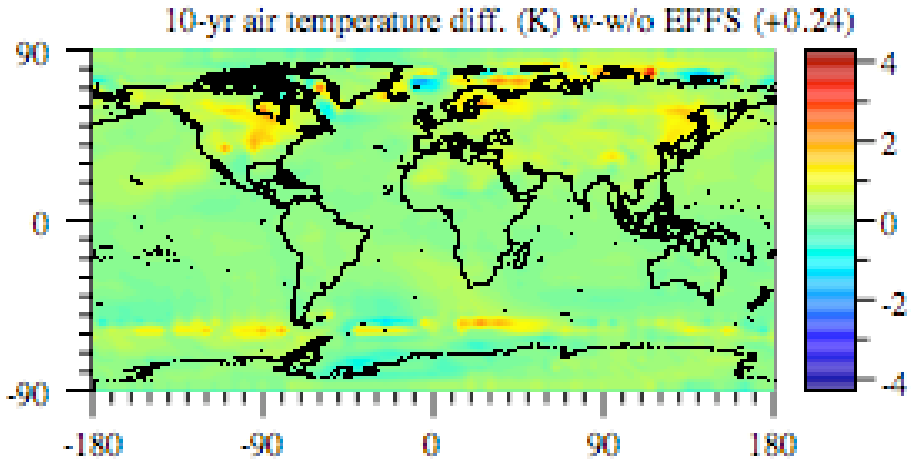
w-w/o AGHG+AAP+US



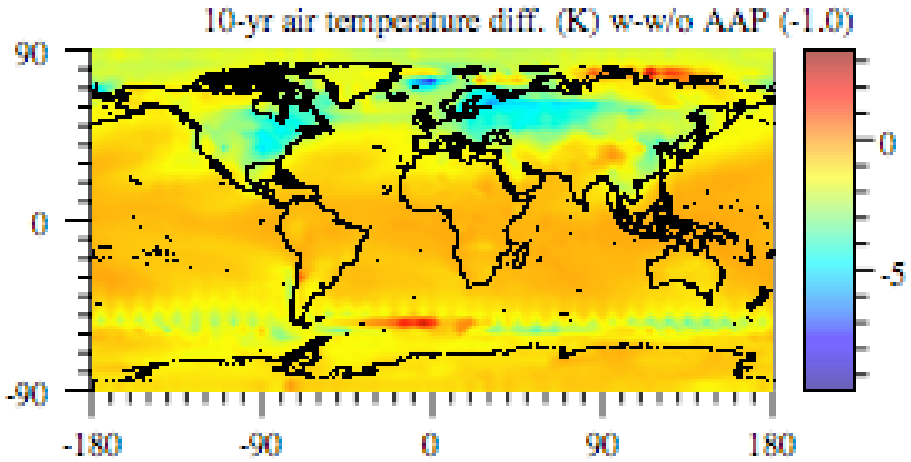
w-w/o AGHG



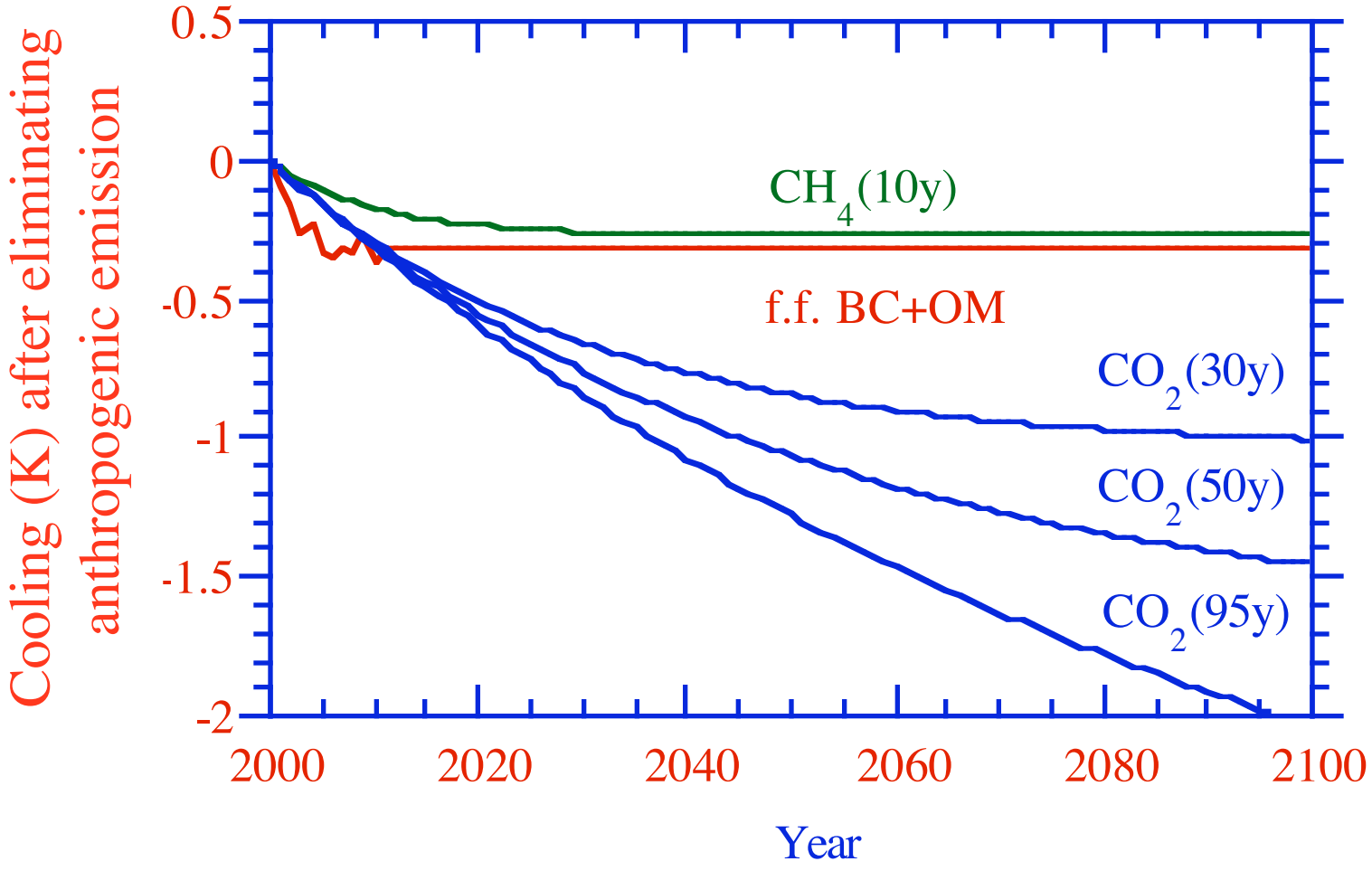
w-w/o ff. soot



w-w/o AAP

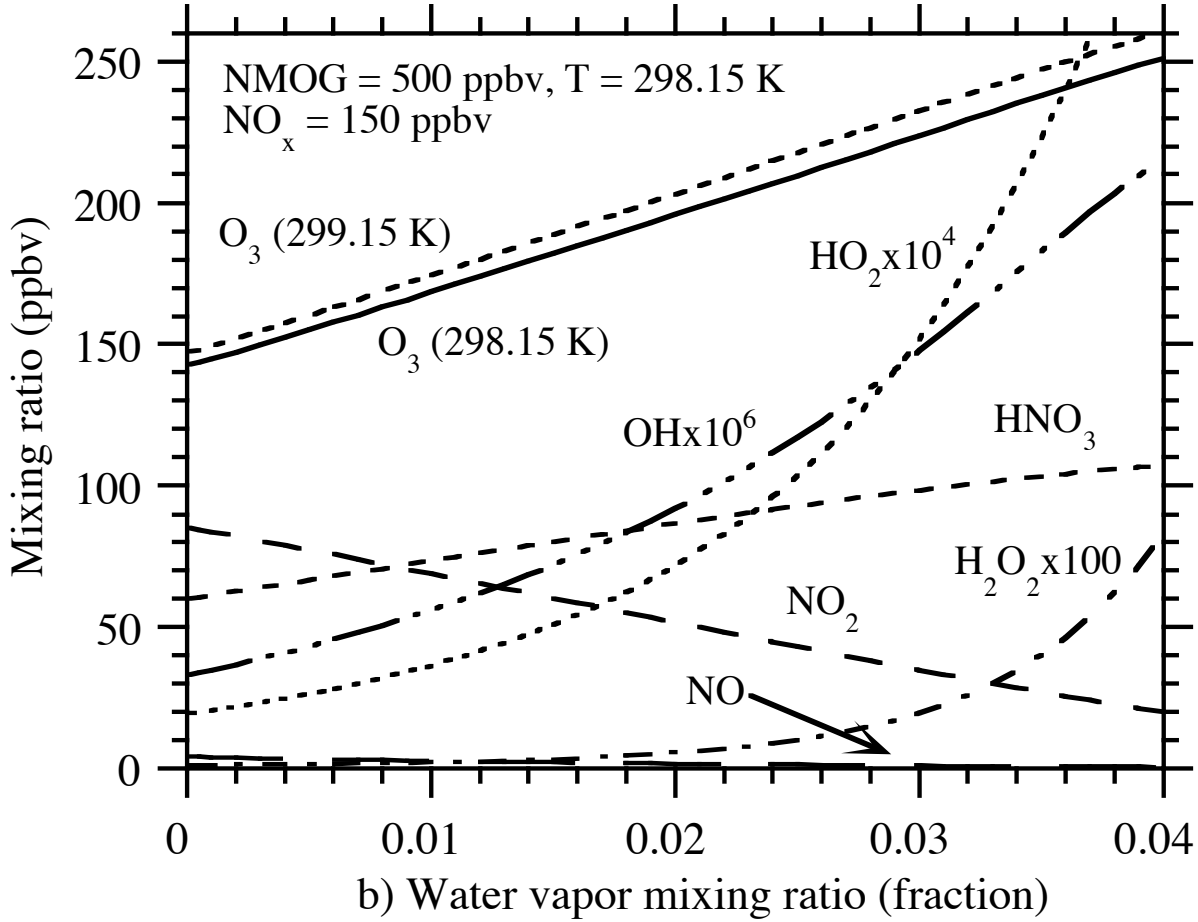


Global Temperature Changes Due to Eliminating Anthropogenic CO_2, CH_4, f.f. BC+OM Emission



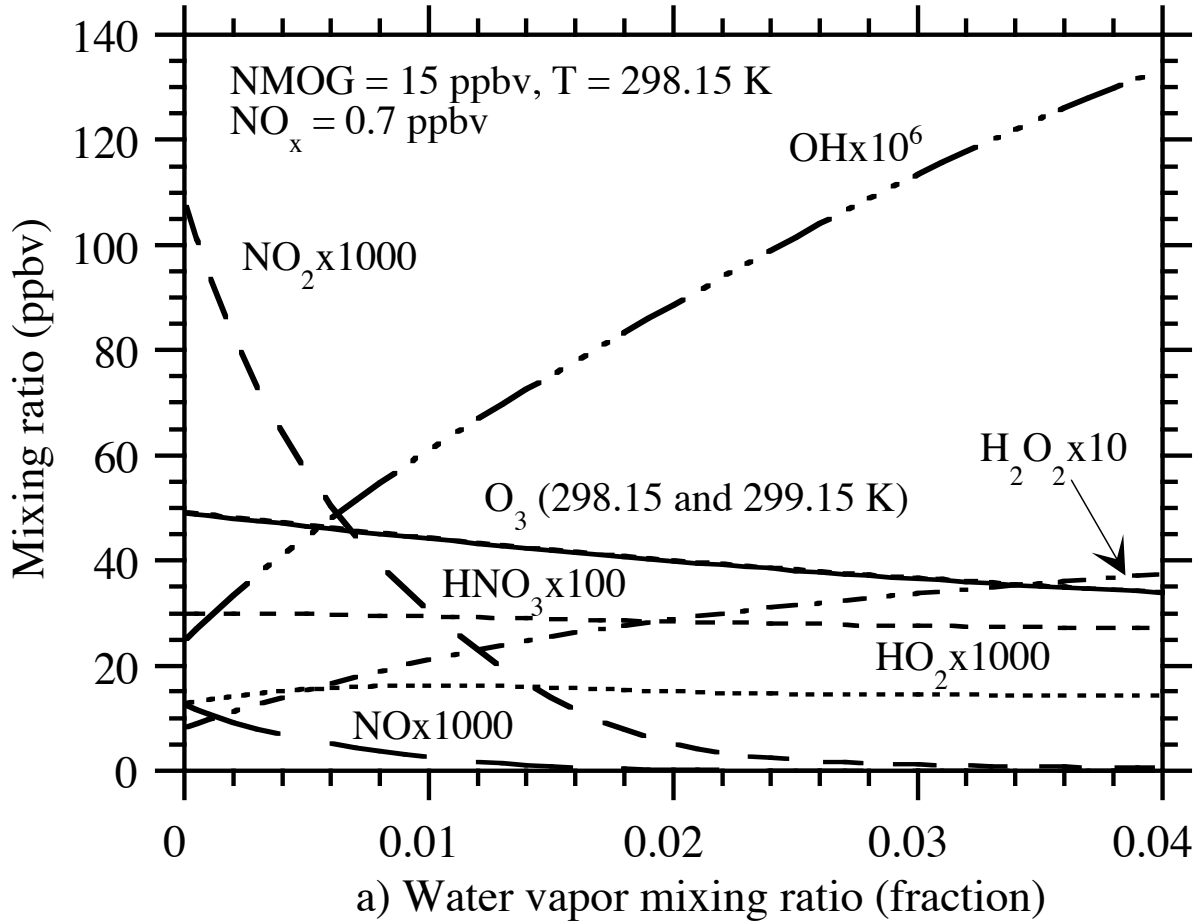
Causal Effect of CO_2 on Mortality

An increase in water vapor or an increase in temperature increases ozone in urban areas (high NO_x, high NMOG).



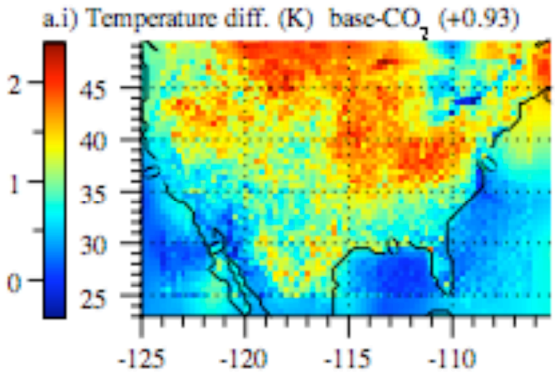
Causal Effect of CO_2 on Mortality

An increase in water vapor decreases ozone and an increase in temperature causes little ozone change in rural areas (low NO_x; low NMOG).

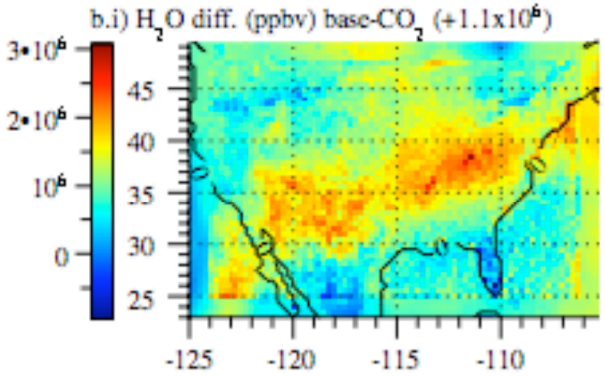


Causal Effect of CO_2 on Mortality

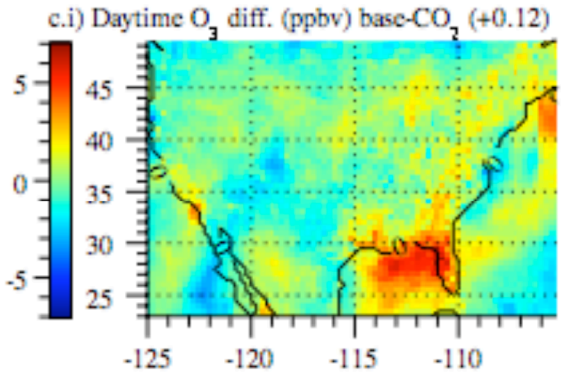
Global-regional nested simulations demonstrate that CO_2 alone increases temperature, water vapor, ozone, and PM



Δ Temperature



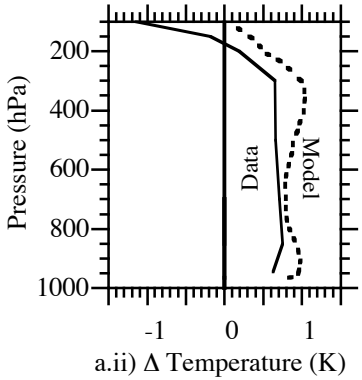
Δ Water vapor



Δ Ozone

U.S. Δ ozone deaths/yr per 1 K +500 (190-575)
U.S. Δ PM2.5 death/yr per 1 K +640 (160-1280)
U.S. Δ Total deaths/yr per 1K +1140 (350-1855)

World Δ Total deaths/yr per 1K +24,000 (7200-37,000)



Potential Effects of E85 vs. Gas: Emission Differences From Data

	Percent change
Oxides of nitrogen	-30 (-59 to +33)
Carbon monoxide	+5 (-33 to +320)
Total organic gas	+22 (+38 to +95)
Methane	+43 (+43 to +340)
Formaldehyde	+60 (+7 to +240)
Acetaldehyde	+2000 (+1250 to +4340)
1,3-butadiene	-10 (0 to -13)
Benzene	-79 (-62 to -85)
PM number	0 (+100)
PM mass	0 (+31)

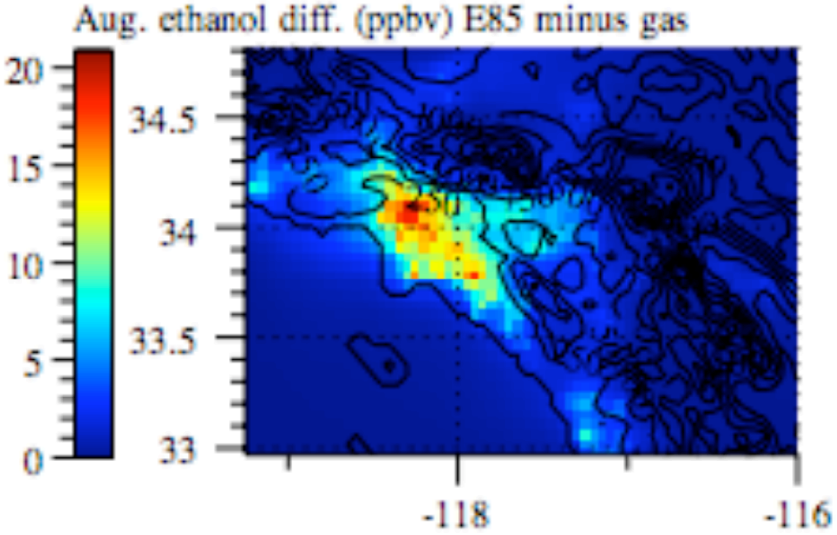
Comparison of Emission Assumptions With Recent CARB and Other Data

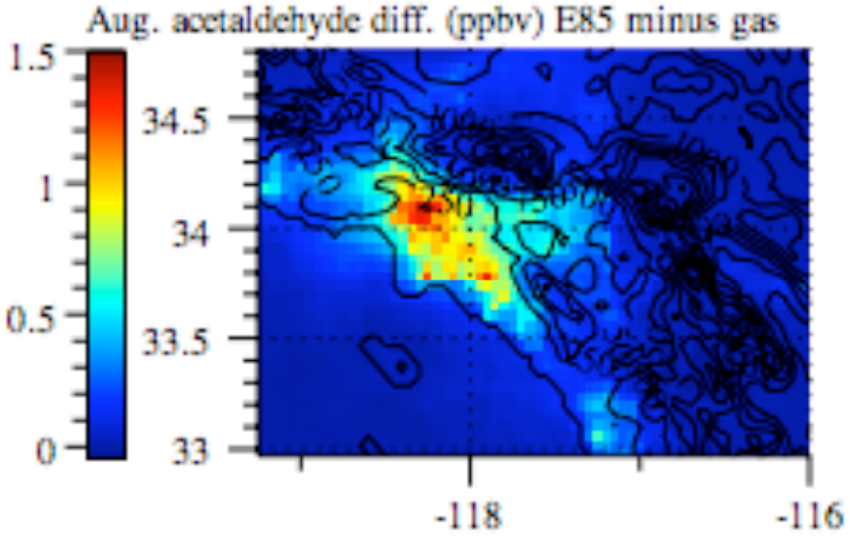
Percent change E85 minus gas

	Cert data (2006)	Jacobson (2007)
NMOG	+45%	+19.6%
NO_x	-29.7%	-30%

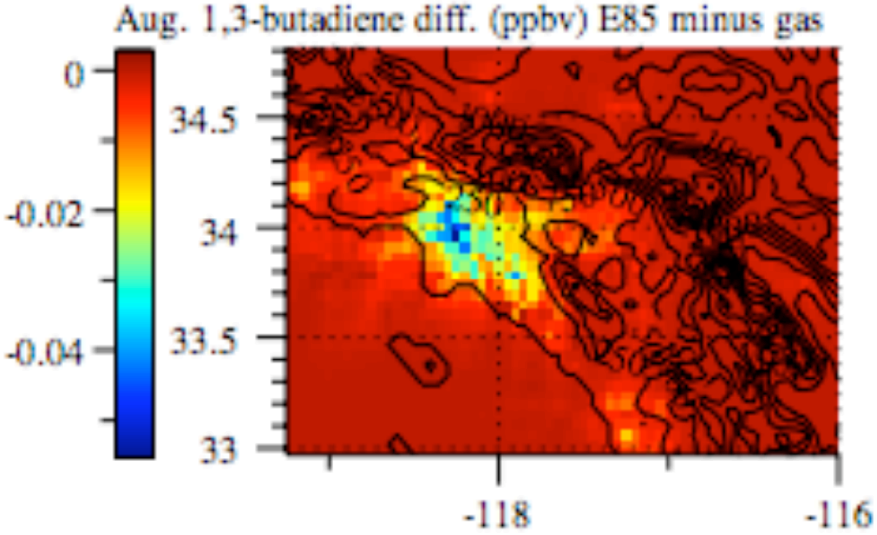
	Whitney (2007)	Jacobson (2007)
Benzene	-64%	-79%
1,3-butadiene	-66%	-10%
Acetaldehyde	+4500%	+2000%
Formaldehyde	+200%	+60%

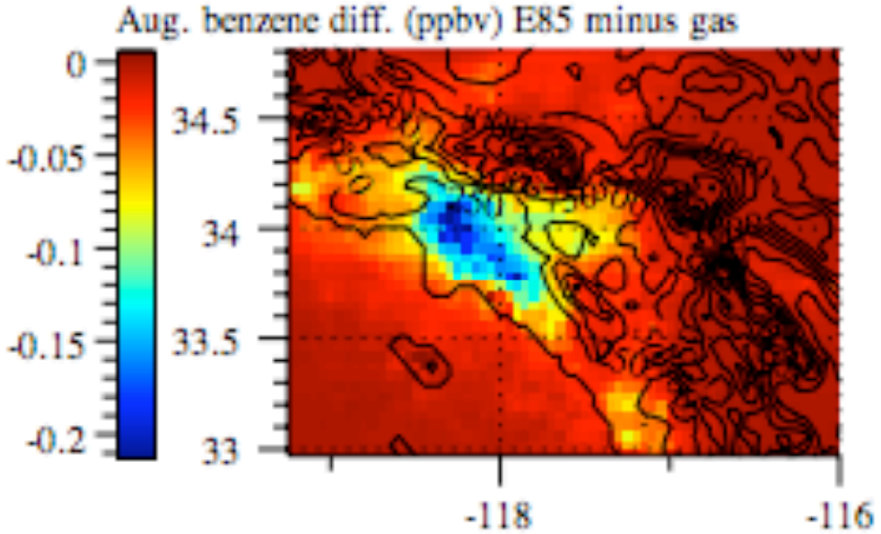
Effect in 2020 of E85 vs. Gasoline on Ethanol and Acetaldehyde



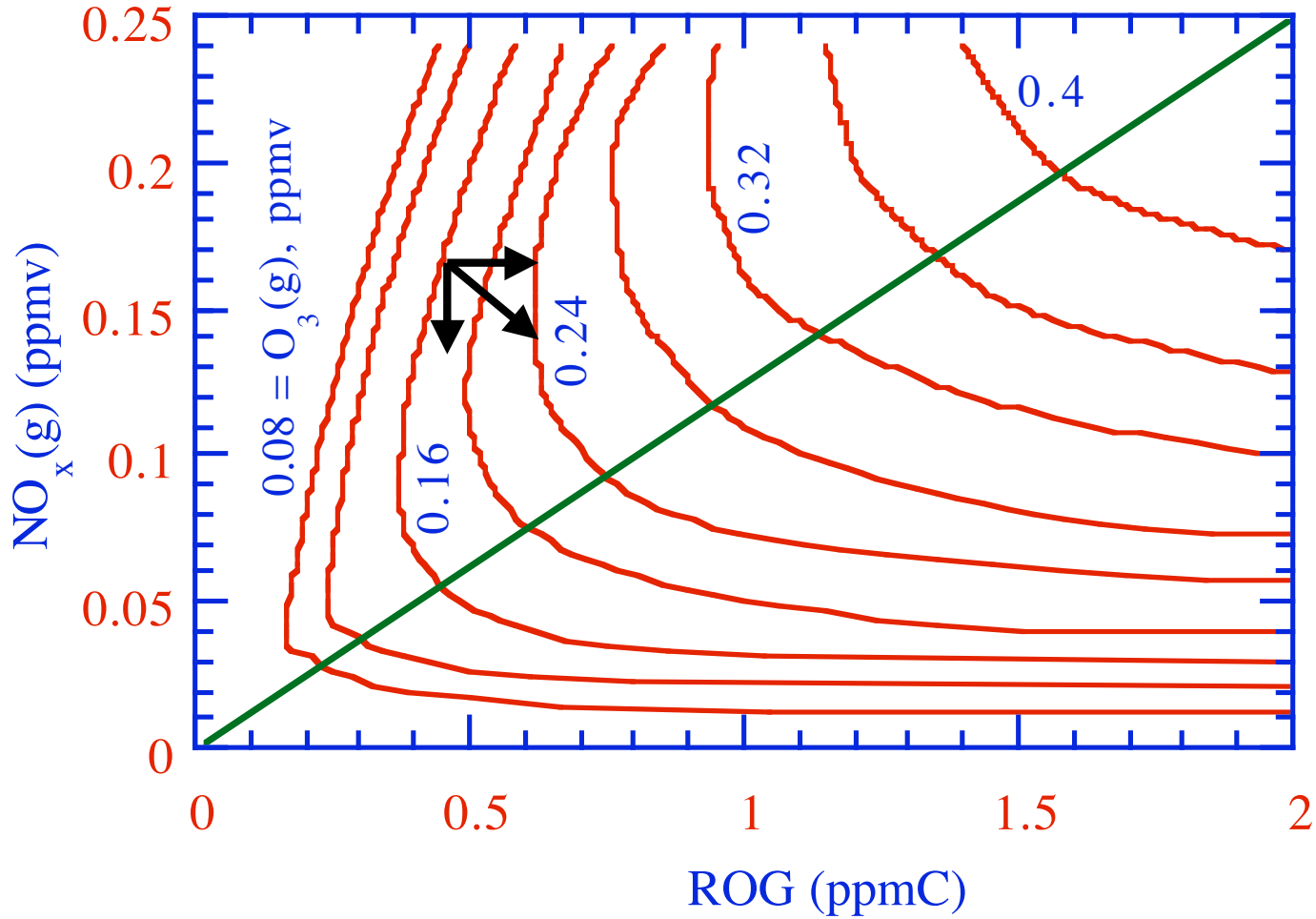


Effect in 2020 of E85 vs. Gasoline on 1,3-Butadiene and Benzene

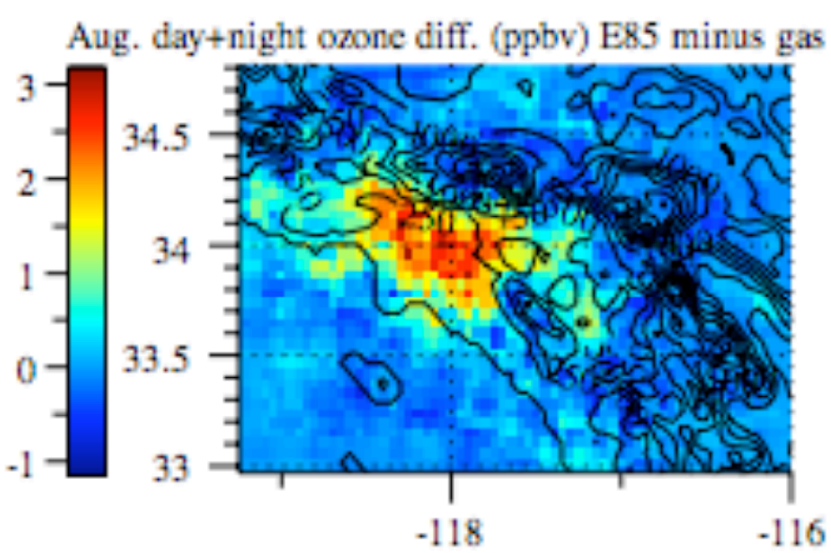


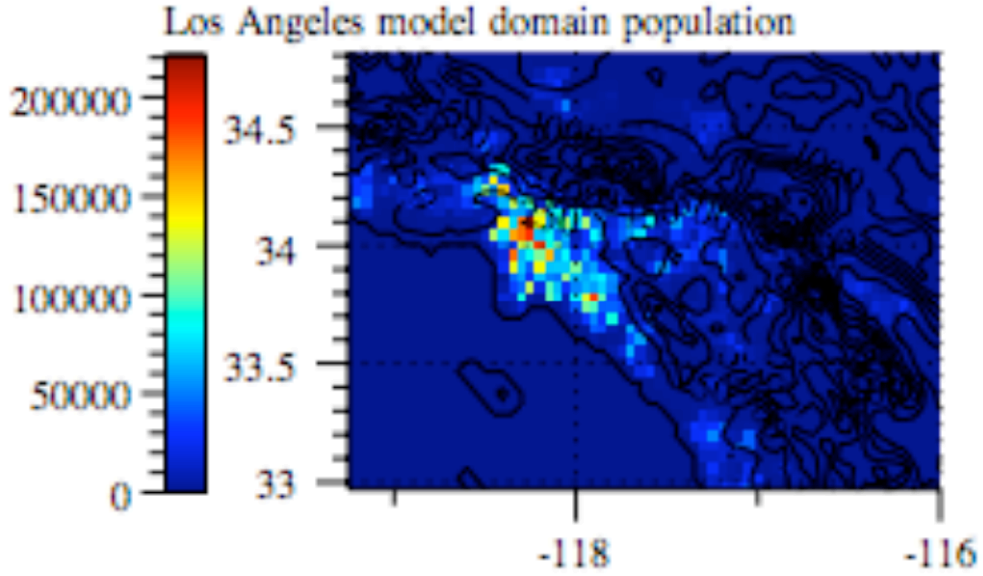


Ozone isopleth



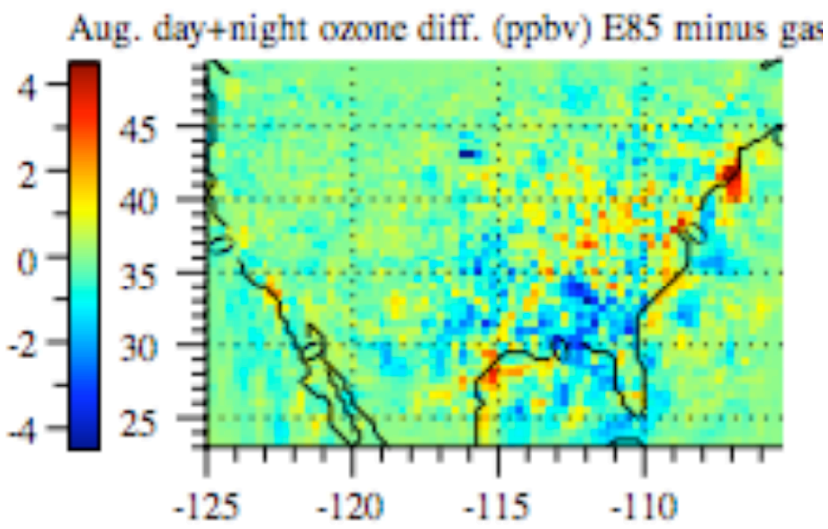
Effect in 2020 of E85 vs. Gasoline on Ozone and Health

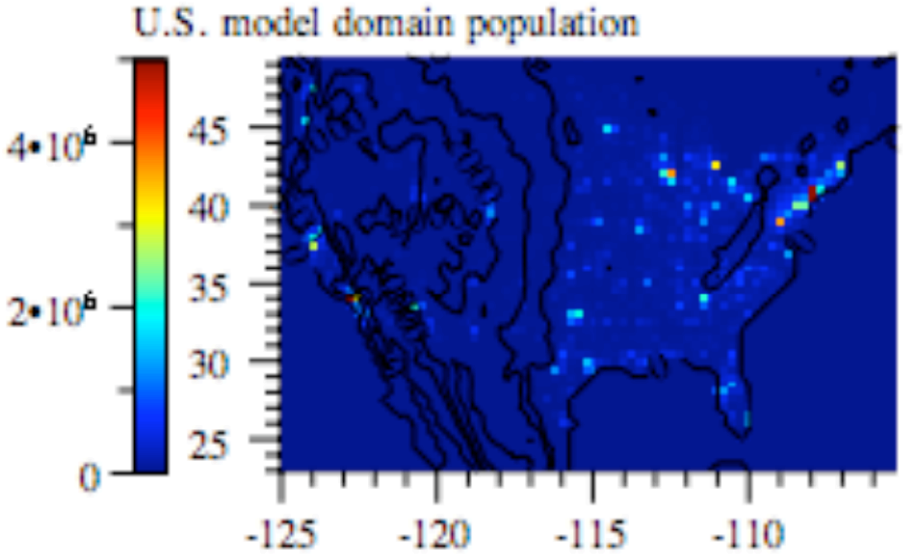




Δ Pop-weighted O_3≥35 ppbv E85 minus gas: +1.33 ppbv
Δ O_3 deaths/yr: +120 (+9%) (47-140)
Δ O_3 hospitalizations/yr respiratory illness: +650
Δ O_3 -emergency-room visits/yr for asthma: +770
Δ Cancer/yr : -3.5 to +0.3

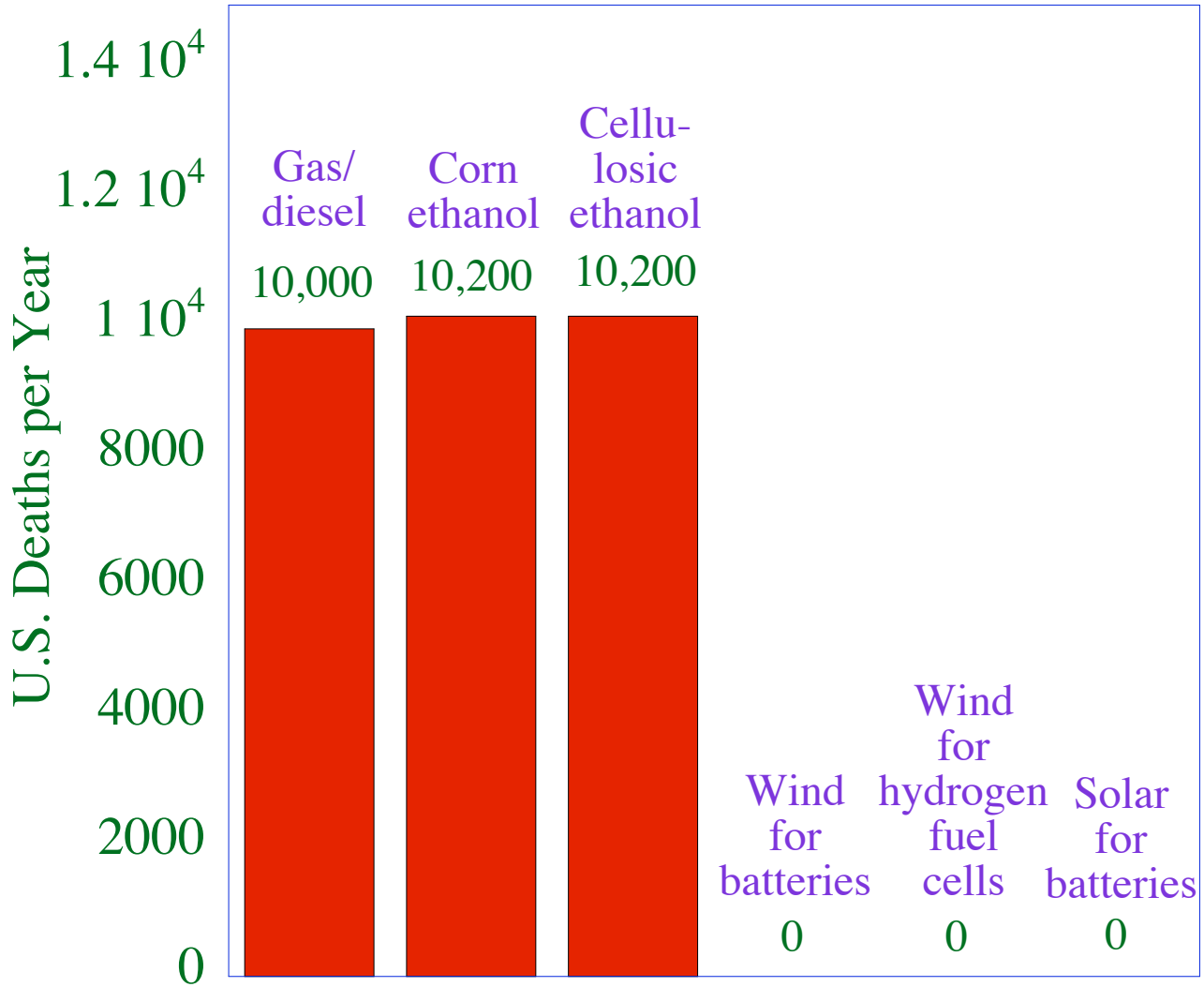
2020 U.S. Effects of E85 vs. Gasoline



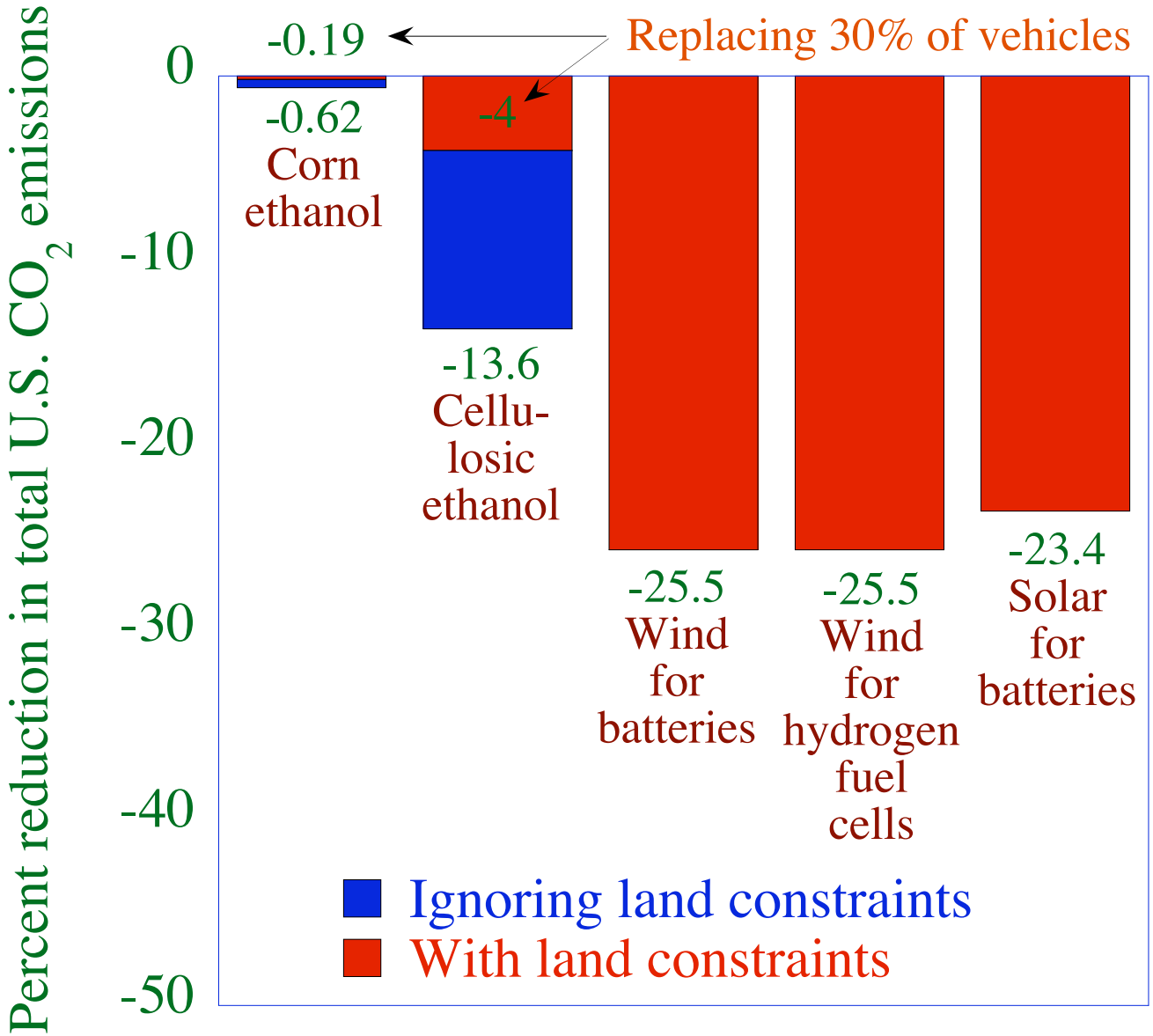


Δ Pop-weighted ozone ≥ 35 ppbv E85 minus gas:	+0.28 ppbv
Δ Ozone deaths/yr:	+185 (72-213)
Δ Ozone hospitalizations/yr respiratory illness:	+990
Δ Ozone-emergency-room visits/yr for asthma:	+1200
Δ Cancer/yr	+3 to -29

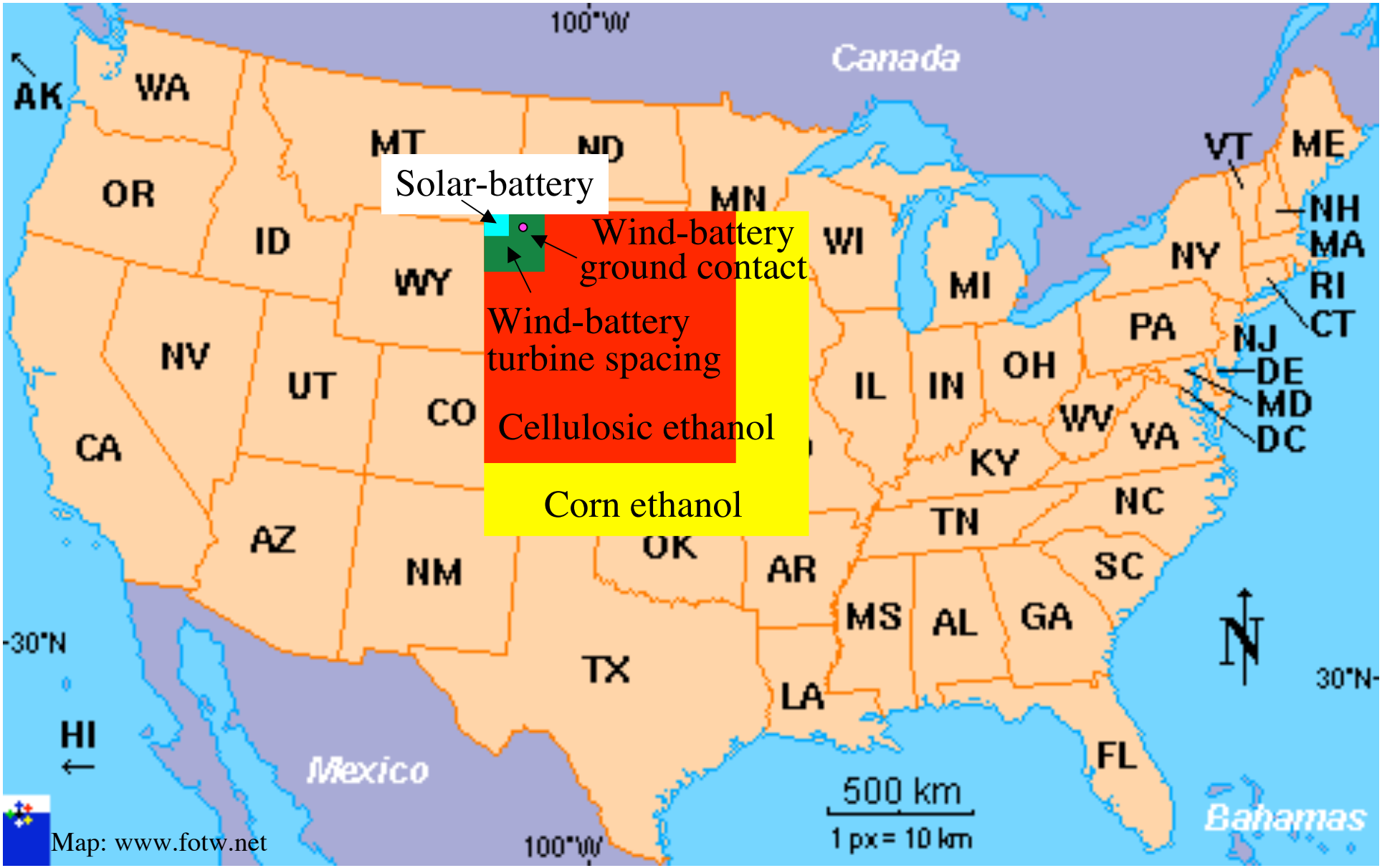
Future U.S. Deaths Per Year From Onroad Vehicle Emissions



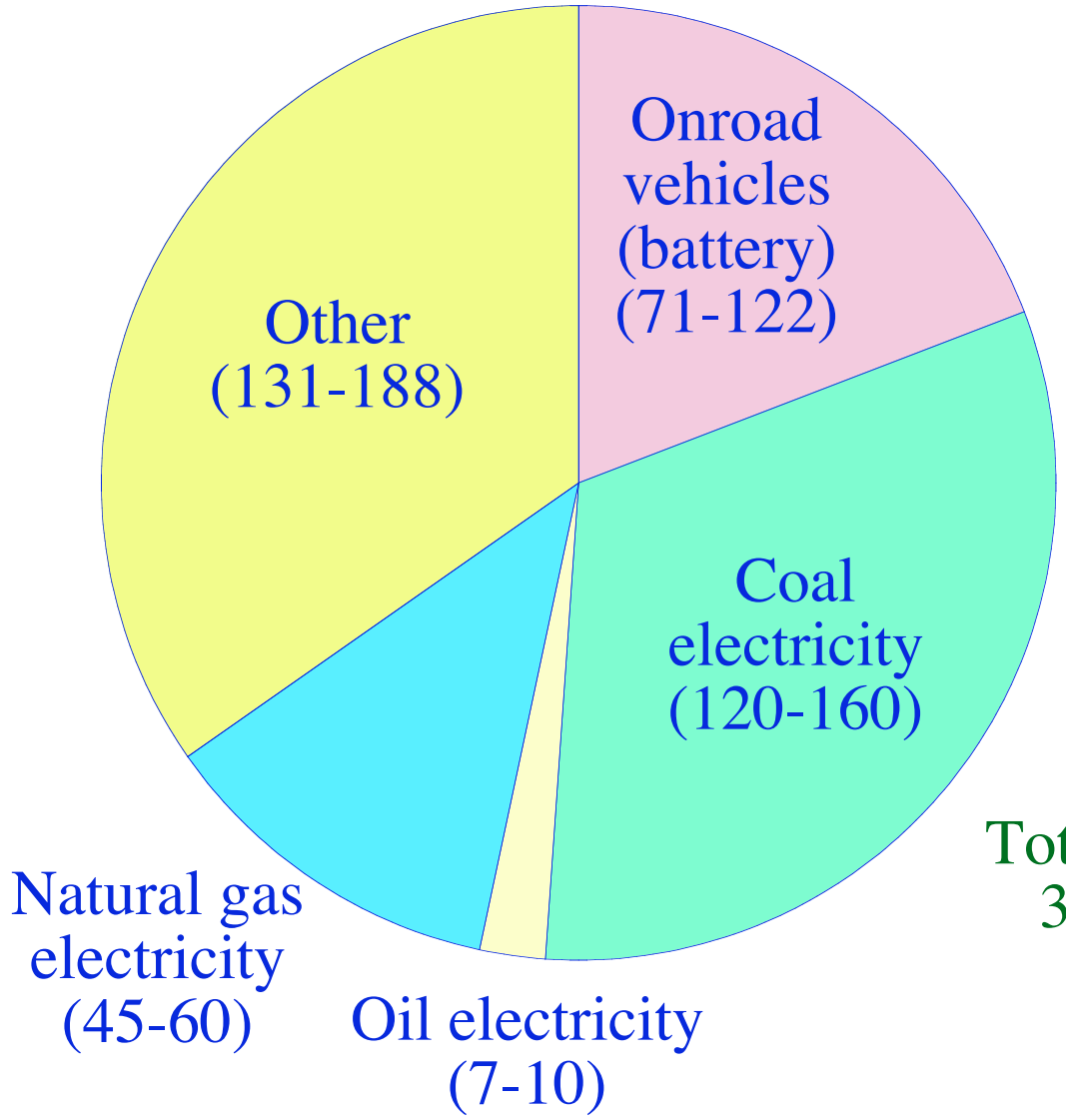
Percent Decrease in Total U.S. Carbon Dioxide Upon Replacing 100% of Onroad Vehicles



Area to Power 100% of U.S. Onroad Vehicles

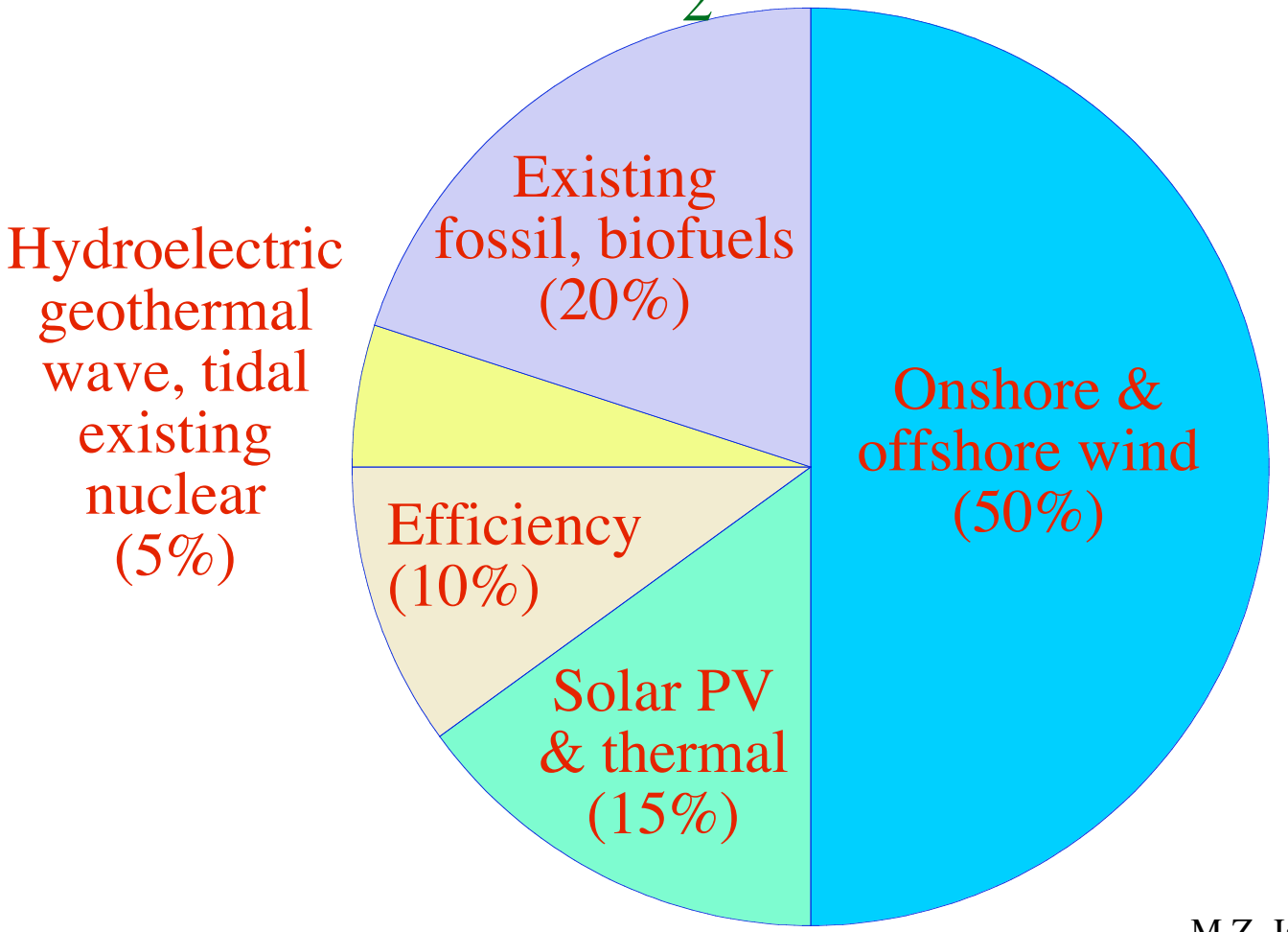


Thousands of 5 MW Wind Turbines Needed to Displace 100% U.S. CO_2



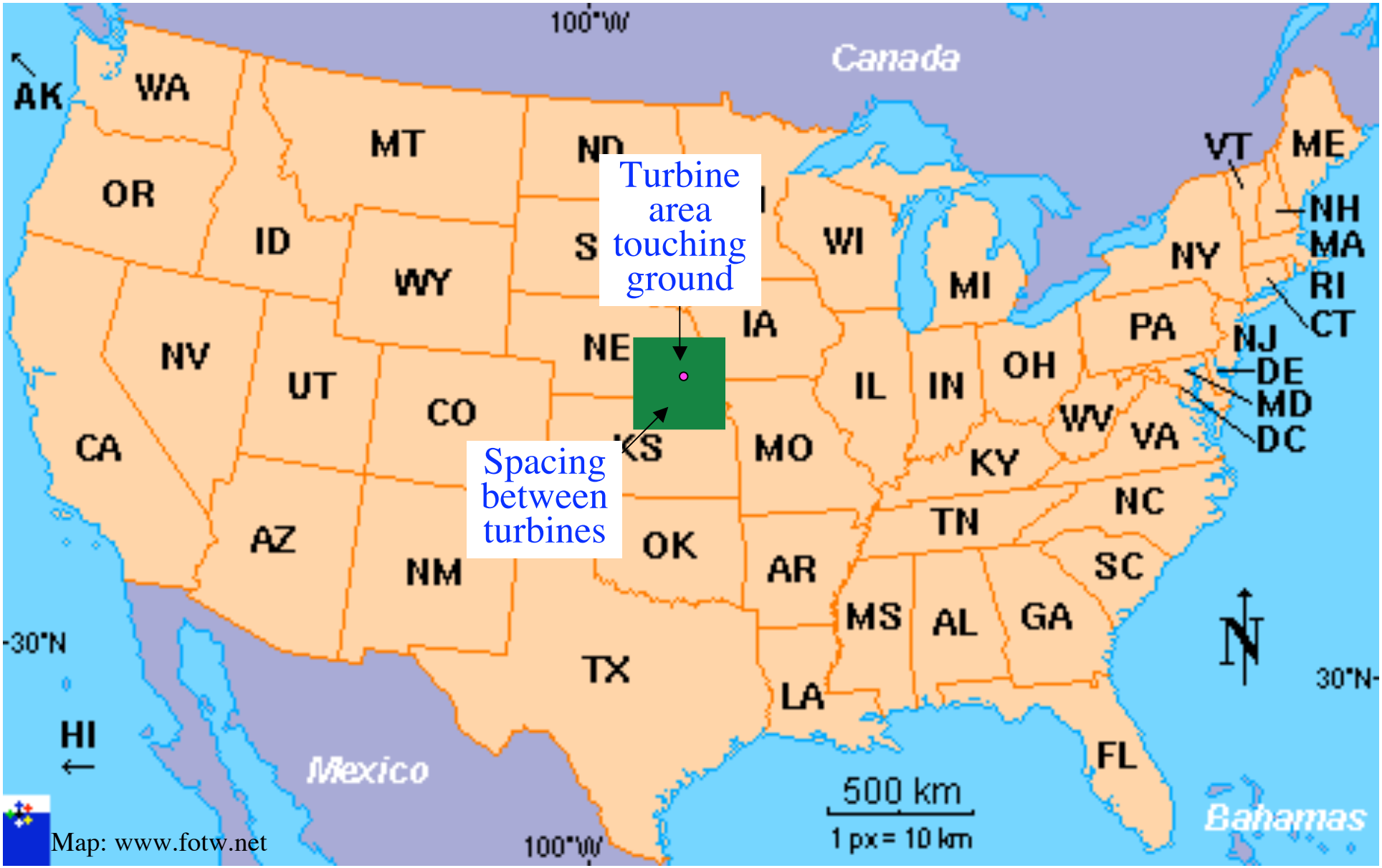
M.Z. Jacobson

Path to Satisfy All U.S. Energy Needs and Reduce CO_2 and BC by 80%



M.Z. Jacobson

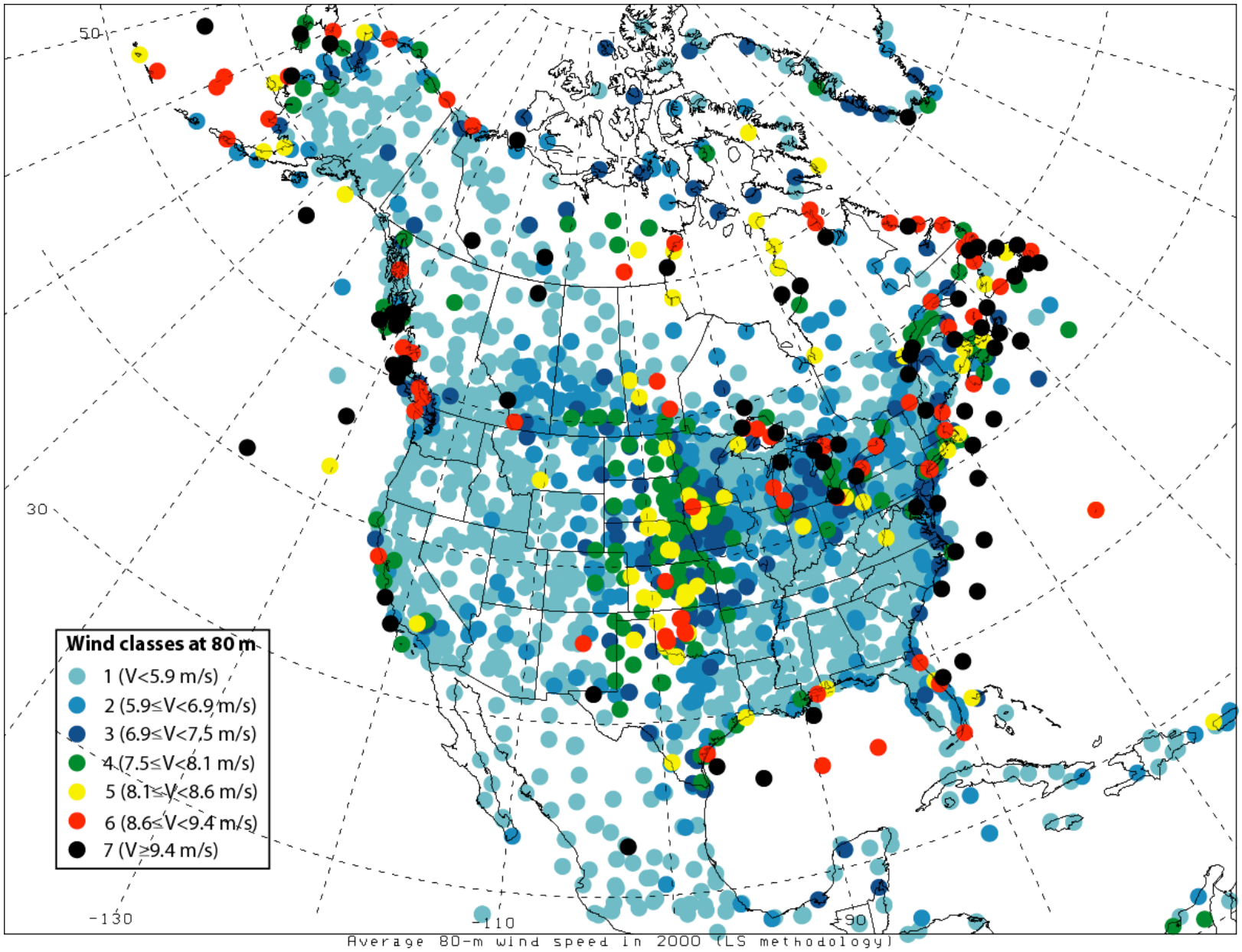
Land Area For 50% of US Energy From Wind



Alternatively, Water Area For 50% of US Energy From Wind

Mean 80-m Wind Speed in North America

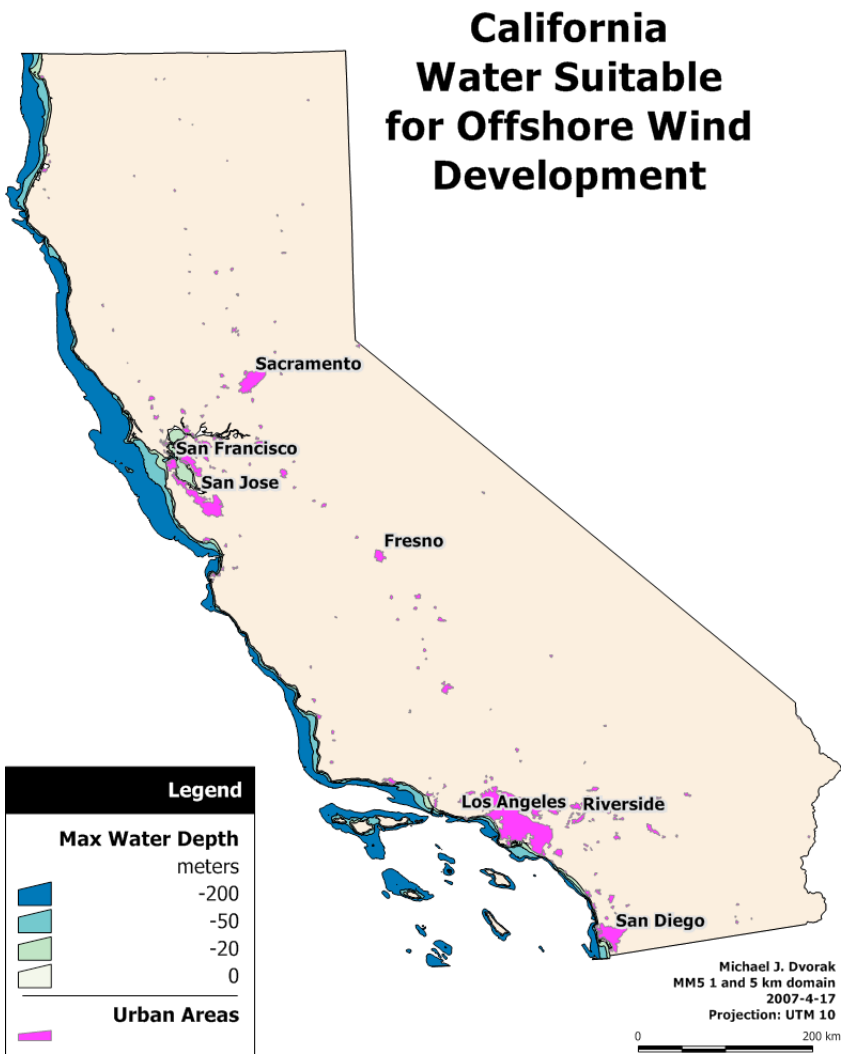
Archer and Jacobson (2005) www.stanford.edu/group/efmh/winds/

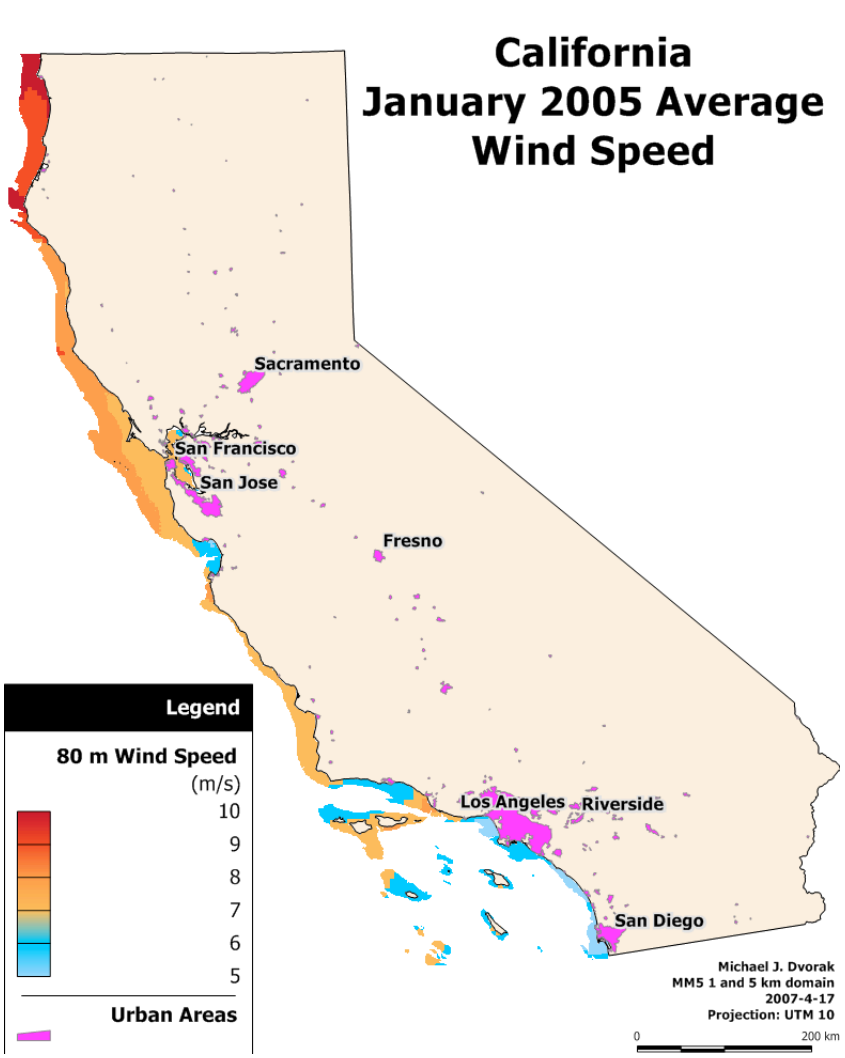


Percent of Land+Near Shore Stations With Annual Wind Speeds > 6.9 m/s at 80 m

Europe	14.2
North America	19.0
United States over land	15.0
United States over land+near shore	17.0
South America	9.7
Oceania	21.2
Africa	4.6
Asia	2.7
Antarctica	60
Global over land	13

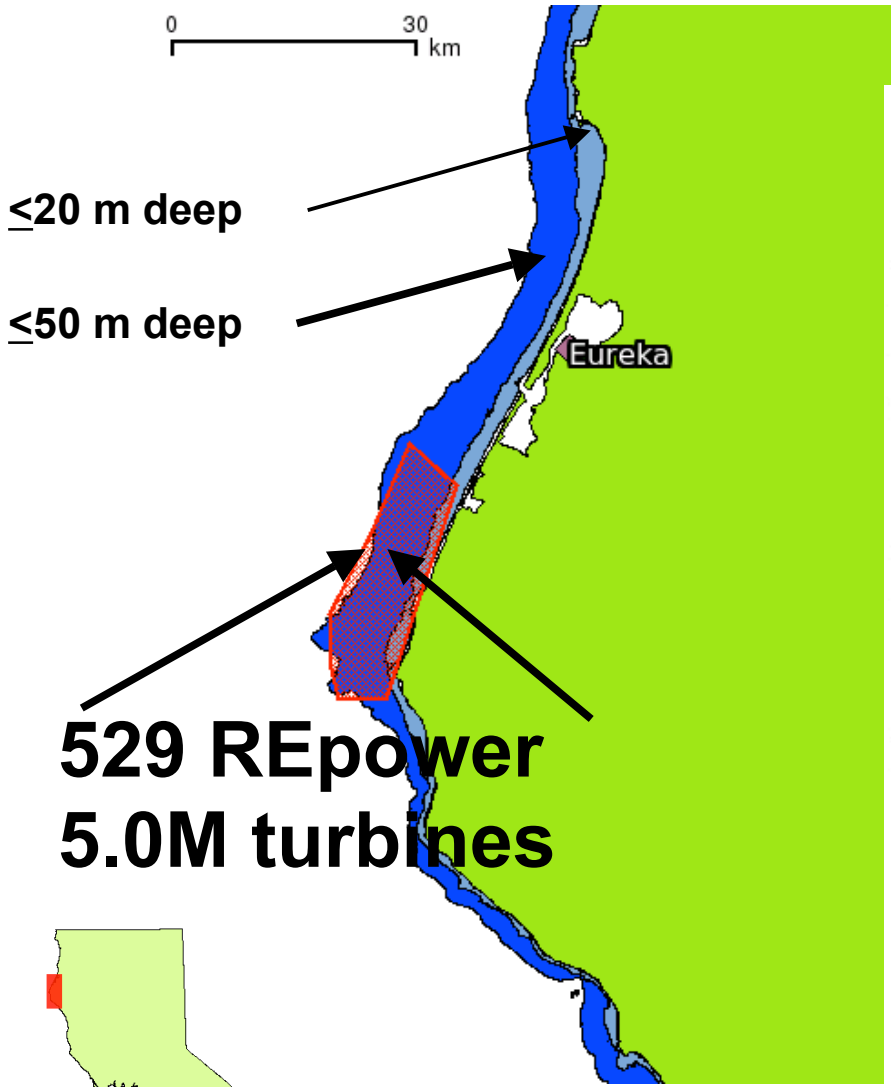
Archer and Jacobson (2005)

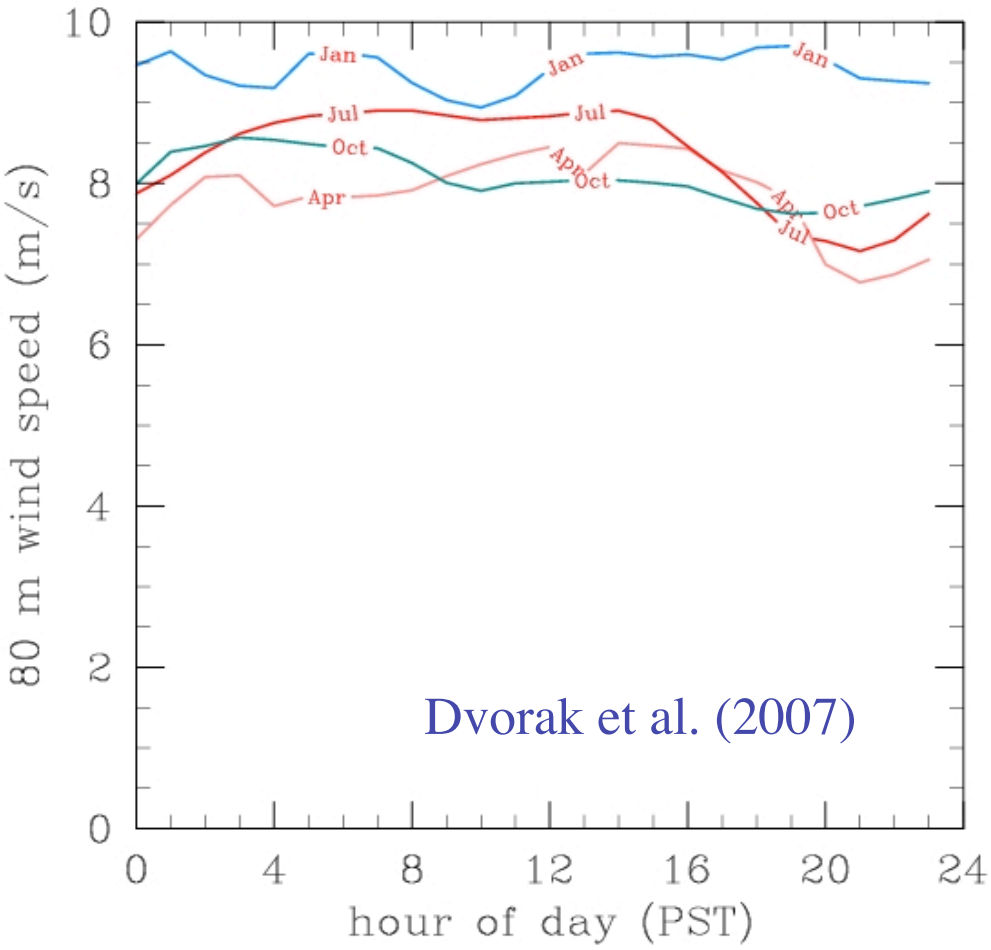


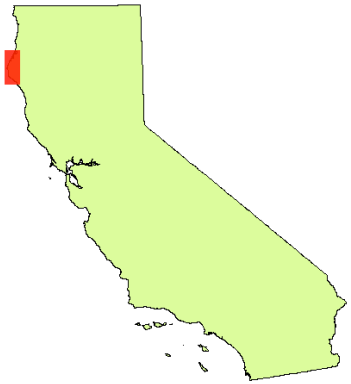


Dvorak et al. (2006)

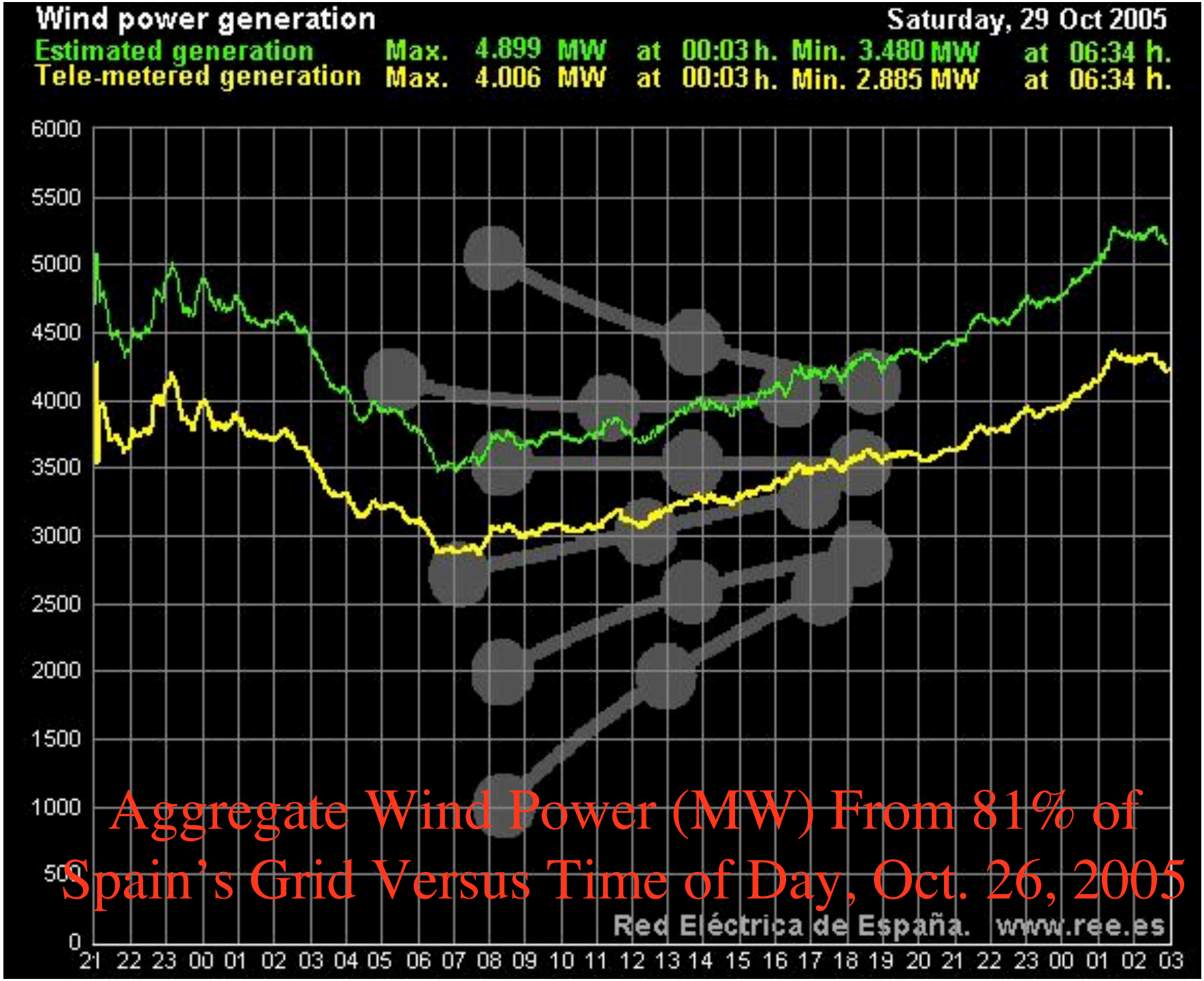
Eureka Wind Park Example (Preliminary)







2645 MW capacity (529 5 MW turbines), capacity factor of 42%
Yields 5.9 TWh/yr (8.2% of California's carbon electricity)
Requires about 28 km (18 mi) or 2.1% of California's 840 mi coast.



Aggregate Wind Power (MW) From 81% of Spain's Grid Versus Time of Day, Oct. 26, 2005

Birds and Wind

U.S. bird deaths from current wind turbines 10,000-40,000/yr (!)
U.S. bird deaths from communication towers: 50 million/yr (!)
Worldwide bird deaths from avian flu: 200 million/yr (%)

Est. bird deaths with 2,500,000 turbines worldwide: 2.5-10 million/yr

Outdoor human deaths reduced by these turbines: 800,000/yr (*)

The effect of wind turbines on birds will be small relative to the benefit of reducing fossil-biofuels on human and animal illness.

(!) Bird Conservancy (April 2006); (%) San Jose Mercury News (April 2006)
(*) World Health Organization (2002)

Summary

Global warming will hasten as aerosol pollution decreases.

CO_2 increases air pollution mortality due to its effect on temperature, water vapor, and atmospheric stability, which increase ozone and particulate matter in urban areas.

80% reductions in current emissions are needed to stabilize CO_2. Corn ethanol cannot practically reduce CO_2 in the U.S. by more than 0.07-0.2%; cellulosic ethanol cannot reduce CO_2 by more than 1.3-4%, based on current understanding.

Wind-battery electric vehicles can reduce U.S. CO_2 by 25.5%; solar-battery electric vehicles can reduce it by 23.4% Wind turbines require 30 times less land than corn ethanol and 20 time less land than cellulosic ethanol for the same power.

Sufficient wind and solar are available worldwide to supply all electric and nonelectric energy needs simultaneously several times over.

Summary

Converting all U.S. gasoline vehicles to ethanol (E85) vehicles will not improve air quality. At 100% penetration, it may enhance air pollution mortality from 0 to 200/yr deaths above the 10,000/yr due to gasoline in 2020. At 10-30% penetration, deaths may still be 0 to 20-60/yr above 10,000/yr.

The long lifetime of unburned ethanol may result in a global source of acetaldehyde and ozone.

Each ethanol or gasoline vehicle developed from now on will enhance air pollution and climate problems significantly compared with each renewable-powered battery-electric or hydrogen fuel cell vehicle produced.

More info: www.stanford.edu/group/efmh/jacobson/E85vWindSol

AGENDA: 3

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

DRAFT MINUTES

Advisory Council Technical Committee
9:00 a.m., Monday, October 1, 2007

1. **Call to Order – Roll Call.** Chairperson Sam Altshuler, P.E., called the meeting to order at 9:17 a.m. Present: Sam Altshuler, P.E., Chairperson, Louise Bedsworth, Ph.D., Robert Bornstein, Ph.D., William Hanna, John Holtzclaw, Ph.D., (9:34 a.m.), Kraig Kurucz.

2. **Public Comment Period.** There were no public comments.

3. **Approval of Minutes of August 6, 2007.** The Committee provided minor revisions to the minutes. After discussion, Dr. Bornstein moved that the approval of the minutes be deferred until Dr. Mark Jacobson reviews that portion of the minutes containing his presentation; seconded by Mr. Kurucz; carried unanimously without objection.

4. **Presentation on Methane Trends in California:** *Dr. Marc Fischer of the University of California Berkeley gave a presentation to the Committee on Methane Trends in California.*

   Chairperson Altshuler introduced Dr. Marc Fischer. Dr. Fischer stated he is a scientist from the Lawrence Berkeley National Laboratory (LBNL) and has been trained in physics and is now working in energy, atmosphere, and environment problems. Dr. Fischer noted he mostly worked in atmospheric science and some amount of bio-geo chemistry (how land surface processes affect atmospheric constituents; in particular green house gases). The Committee members then introduced themselves.

   Dr. John Holtzclaw arrived at 9:34 a.m.

   Dr. Fischer provided background information and stated that the LBNL is doing a wide-range of research in climate and air quality. The climate related studies are broadening from what has been aerosol and green house gas (GHG) measurements and modeling to include climate modeling at both regional and now global scales. The emphasis in GHG's has focused on the terrestrial exchange from ecosystems to the atmosphere. Human emissions are important, therefore, the LBNL is also moving in that direction. The outline of the presentation is:
   - An overview of non-CO_2 GHGs,
   - A snapshot of California and Bay Area emissions,
   - Multiple methods for estimating emissions to verify emission reductions,
   - Initial atmospheric measurement network that is starting this month,
   - Conclusions, and
   - Directions for further work

   Continuing Dr. Fischer reviewed the slide entitled GHGs in Time and Space. The first figure is a map of the earth that shows locations at which the National Ocean and Atmospheric

Administration (NOAA) have been making measurements of GHGs for the past couple of decades. Most of the sites are not in terrestrial areas, but are often in the oceans. The measurements were taken as background monitoring. Interest is now focusing on what the emissions are in the terrestrial and human influence zones, therefore, there is a need for additional measurement points. The main point of the slide is that there is a record for how atmospheric concentrations of GHGs have changed and there are examples globally. Dr. Fischer stated that to understand how changes are occurring one cannot rely solely on models; measurements are essential.

The next plot shows how nitrous oxide (N_2O) has changed both in time (the horizontal axis) and with latitude, and the amount (the vertical axis). Over the period from 1990 to 2000 there has been a steady rise in N_2O and there is a strong latitudinal gradient. Dr. Fischer emphasized that N_2O has a very long lifetime in the atmosphere; the removal mechanisms for it are slow and it is hence fairly well mixed. The gradient from stronger in northern latitudes to weaker in the southern latitudes indicates a northern latitude source.

The second plot shows the same thing for methane. Again, there is a very strong latitudinal gradient where there is much more methane in the northern hemisphere than in the southern. There is a comparatively weaker growth in the last decade. Methane has a much shorter lifetime in the atmosphere and is removed by OH. Methane has a different set of sources from N_2O.

The three slides show what contemporary measurements look like. There is a network of global monitoring stations which are detecting the background methane, CO_2, and N2O. The next slide, Overview of non-CO_2 GHG, is a plot that shows the total non-CO_2, CO_2, and other forcings of the atmosphere on the globe. The graph shows the change in forcing from pre-industrial times to present. The graph indicates that from pre-industrial times, there have been very significant increases in GHG concentrations. The non-CO_2 gases, which are much stronger absorbers than CO_2 by mass, have increased enough that their combined affect for forcing is comparable to CO_2. Regarding the ozone on the chart, Dr. Fischer stated that it is an increase in tropospheric ozone from pre-industrial to current times and it is part of the IPCC assessment on climate forcing. This forcing may be a combination of tropospheric and stratospheric ozone. Dr. Fischer reviewed the potency of GHGs and stated that methane is about 20 times as potent as CO_2, N_2O is about 300 times as potent on a mass weighted basis, and high Global Warming Potential (GWP) gases that include CFCs, HFCs, and SF_6.

Dr. Fischer discussed the recent trends in global warming gases and where they may head in the future. The top panel of the slide shows the increase in the gases over the 1990 to 2010 period. The blue dots indicate measurements and the yellow and red lines indicate what future increases might look like for CO_2, methane, N_2O and GWPs. The middle set of plots on the slide are the same gases, but are noted as a per year increase in concentration. At the bottom is the sum and where things are potentially headed. The plot on the bottom right goes out to 2050. How people conduct themselves will have different affects on the forcing. Dr. Fischer stated that there have been very strong increases in both CO_2 and N_2O in the last 15 year period; the future for N_2O depends on agricultural practices; and on fuel combustion. CO_2 is predominately emitted by fossil fuel combustion and a small amount by other industrial processes.

The picture is different for methane. Methane was increasing from 1990 to 2000, but it started to level off after about the year 2000. This indicates that something different is going on with methane. It has not, in the very recent past, been increasing as quickly and there is active research going on to try to understand what is causing the global methane cycle to diverge from a steady growth. In response to a question from Chair Altshuler, Dr. Fischer stated that he felt that, in a statistical since, the trend is significant. In a long-term perspective of where things are going, it is too early to tell. Because methane has a complicated bio-geo chemistry -- there are many different sources -- it is difficult to say what is causing the trend. Methane is emitted largely by anaerobic decomposition processes. Many people believe that the decreased methane emissions come from thawing tundra which used to be under water. It is now drying and that may be causing this trend. Another thought is that it is possible that the sources of methane coming from human activities has slowed, but it is too soon to determine what the cause is.

Continuing, Dr. Fischer provided information on what can be done in terms of monitoring a GHG if measurements and models are used together. How can one infer the sources and sinks of methane? The plot, entitled Inferring Global CH_4 Sources from 2003 Variances in CH_4, shows the results from a global inversion of atmospheric methane. Using the NOAA flask network data, an inverse model has been run where prior estimates are taken of methane emissions that are combined with a global transport model. This indicates what the surface emission is that is most consistent with the observations. The plot shows a year, per month, of surface methane concentrations models using prior estimates of what methane emissions look like and adjusting that prior estimate to be most consistent with the observations. There is a consistent trend of higher methane in northern latitudes and lower methane in southern latitudes. The plot also shows little spots of high methane showing up at different places in the map. These are regions where the model finds there must have been more methane in order to be consistent with the observations. The peaks are generally in the northern latitude summers.

Dr. Fischer emphasized that by combining actual measurements of concentration, with models of transport and prior estimates of emissions, one can get a better feeling for where the emissions are occurring and how strong they are. There is now a problem with dealing with emissions on a national, state, regional, or county-level scale. The argument is to move down and scale from global to these smaller scales using the same kind of techniques, but with improved measurement and modeling methods.

Chair Altshuler observed that, from an energy perspective, the plot shows that West Virginia and the east coast might be the “hot spots” in the United States. These are areas in which coal is used. In California and the west coast the tendency is the use of natural gas. Chair Altshuler questioned if there a correlation. Dr. Fischer stated that this plot is not emissions, but surface level concentrations. Western North America uses a lot of natural gas, but there is a lot of ocean air diluting that source to the atmosphere from natural gas use. In this model, it is being diluted away; the model also may underestimate how much emission is occurring at the Western boundary. There is only one station at Trinidad Head, which is north of the Bay Area and is a “clean” environment to judge what the methane concentrations of the West Coast should look like.

Dr. Fischer stated that measurements of methane gas will be put up at Sutro Tower in San Francisco for a more localized measurement. Dr. Holtzclaw noted that the largest

concentration, and possibly source, tends to be in Russia, but there are no monitors in that area. Therefore, there is more speculation in that area as to the source of emissions. Dr. Fischer stated that this information is a combination of a model that is making an estimate of where the emissions are based on where they believe wetlands occur. The hot spot in northern-central Asia is, in fact, due to assumed methane emission from wetlands.

The next plot shows the total California GHG emission trends. This is total emissions converted into CO_2 equivalent units, million metric tons (MMT) of CO_2. Data was taken from the California Energy Commission's (CEC) GHG inventory that was compiled in 2006. The vertical scale has been truncated and it only shows from 300 up to about 550 MMTs. CO_2 is the largest forcing estimated from inventories for California and it is also the largest source of variation in the trend. CO_2 is where the need is to start controlling GHG emission. The non-CO_2 GHGs constitute about 10% of the total emission. Presently the CO_2 from California is much bigger than the annual increased forcing due to the other gases.

Dr. Fischer made the argument that while CO_2 must be controlled first, the non-CO_2 GHGs have benefits in terms of controls that are not just climate related. Methane is emitted in California by landfills and by agricultural sources, principally animal live stock. If the methane emitted from these sources could be captured, it could be used for energy, rather than just mitigating climate warming by burning the methane to CO_2, which is done currently.

For 2004, Dr. Fischer showed what the non-CO_2 GHG emissions are for a number of different source categories. There are a number of different sources of both methane, a couple of sources for N_2O and the high GWP gases that are all together. All of the estimates are uncertain, it is not known for better than 30% how big any of these sources are. One thing that can be done to reduce the uncertainty is to try to use another method of measuring and inferring what the emission had to have been.

The plot entitled Bay Area GHG Balance was shown next. Dr. Fischer acknowledged that the information for the chart was assembled by the Air District. It shows that the estimated non-CO_2 GHG emissions for the Bay Area are approximately 10% of the total. This is similar to the estimates that the CEC has for the breakdown for the state. The message is that increased transportation fuel efficiency should be a first priority if GHG forcing emissions are to be controlled. CO_2 from transportation is the dominant source. A second message is that rural counties are likely to be different from the average picture. Rural counties will have less transportation and a greater portion of emissions from agricultural GHG emissions. The individual inventory-based emission estimates are likely uncertain at a 20-40% level. Alternatively, looking from the top down, using atmospheric measurements, there is another way of saying how much emission is coming from California.

There was a brief discussion on what changes might occur 20 years from now regarding the rise in GHG emissions and different scenarios on curtailing GHGs. Dr. Fischer stated that if the climate changes enough, there are potential "positive" feedbacks to climate. An example is the large stores of methane in methane ice shelves in very northern latitudes in marine boundary environments called methane clathrates. If it destabilizes and the methane boils off into the atmosphere it could cause a large and rapid "positive" increase in forcing.

Dr. Fischer discussed what is being done to try to estimate the non-CO_2 GHG emissions. The essential ingredients for an independent verification method for GHG emissions include:

- Start with a priori inventory estimates of GHG emissions of interest. Dr. Fischer emphasized that one needs to have the best number and an estimate of how certain that number is.
- A model for atmospheric transport and surface influence "footprints." If a measurement is made at a given point in space and time, how much measured at that point came from what region in the Bay Area.
- A way to combine the emissions and atmospheric influence functions -- what should the "signals" measured in the atmosphere look like.
- Quantitative GHG boundary conditions for what comes from outside of California. What is measured in California is not just coming from California.
- Continuous long-term measurements of the GHG of interest and other species that one can help associate specific sources with the measurements made.
- A statistical framework in order to evaluate whether emission inventories one started with are consistent with the measures; or if the emission inventories need to be revised to be more consistent with the measurements.

The next slide, entitled *A priori* CH_4 Emission Inventories, shows an average year in the year 2004 of methane emissions by county in California. The counties far from urban areas have low emissions and the counties either in, or surrounding, the urban regions have higher emissions. The sources of emissions included landfills, animal agriculture, natural gas distribution and use, wetlands, and crop agriculture.

Attributing a given source to an atmospheric measurement can be done by using isotopic signatures. Natural gas and gasoline have different C13 isotopes. Most carbon is carbon 12; there is a small fraction that is carbon 13. If the carbon 13 content is measured, it can be determined if the CO_2 is more likely gasoline than natural gas. Similarly, carbon 14 is an unstable isotope of radio carbon that is produced in small quantities in the upper atmosphere. Carbon 14 only has about a 5,700 year lifetime and fossil fuels, which are millions of years old, have lost all of their carbon 14. Work is being done to distinguish methane emissions based on these isotopes of methane.

Carbon monoxide and VOCs also help determine what an air mass might have had as a source. The radon content of atmospheric air samples has started to be used to estimate atmospheric mixing. The map on the slide shows an estimate of how much radon is emitted from soils to the atmosphere as a function of space in the Western United States. Radon has a short half life of 3.8 days, therefore if radon is measured in the atmosphere it had to have come from some soil surface in the recent past. Radon will be used as a tracer for how much the air is in contact with the surface. When soils are dry, radon diffuses out of the soil readily; when soils are wet, it is trapped.

Dr. Fischer discussed the measurement sites that are being set up in an effort to measure GHG on a fine spatial scale that can determine regional emissions. The project is being funded by the California Energy Commission and will look at non-CO_2 GHGs. One of the two sites chosen for the first part of the study is Sutro Tower in San Francisco. Measurement tubes will be installed on Sutro Tower and air will be collected in flasks at the bottom of the

Tower. The second site is the KCRA Tower in Walnut Grove, where the tubes have already been installed.

The type of instruments being used on the Towers was reviewed. There will be a flask sampling system and samples will be collected twice a day. NOAA will analyze the samples with very precise and accurate instruments to produce methane, CO_2, nitrous oxide, CO concentrations, SF_6, halo carbons, and, hopefully, $^{13}CO_2$, $^{13}CH_4$, and CDH. The samples will provide information on what the GHG concentrations are above an urban environment influenced by marine processes (at Sutro) and samples from the central valley (KCRA).

In addition, at the KCRA Tower, there will be a continuous methane and CO_2 analyzer that will make a measurement every three minutes. There will also be a CO_2/CO rack system and a radon monitor. In collaboration with the LLNL, flasks full of air will be collected which will be measured to determine the radiocarbon content of the CO_2 in that air.

Dr. Fischer next showed a plot that is a simulation of fossil fuel CO_2 in the surface layer atmosphere as a function of time for the month of July 2005. The simulation was done using an emission inventory constructed by the Environmental Protection Agency (EPA) for nitrogen oxide emission and scaled to CO_2 with a constant factor. The model is the NCAR-MM5 model run at 10 km. resolution. It shows that, with respect to computer modeling, that the emission inventories can be taken and propagated into the atmosphere and it can be determined what the concentrations of fossil fuel CO_2 should look like as a function of time. The same thing can be done for methane with all the sources mentioned and a picture can be generated on what concentrations should look like at different places from different sources. Work will be done to make a better representation for transport. Two main sources of CO_2 in California are the Los Angeles Basin and the San Francisco Bay Area.

A footprint model is used to attribute emissions from a given location to a measurement point later. The footprint model works by releasing imaginary particles at the place the measurement is made and running them backward in time following the air velocity and turbulence characteristics back to the location on the land surface that the sources are present. Dr. Fischer presented a slide showing the areas that are affecting a measurement at Sutro Tower at 230 meters for July 2004. The simulation is being done every three hours of the month of July using a particular implementation of a transport model called the BRAMS model. The goal is for highly resolved and very accurate meteorology for this purpose. If the meteorology is wrong, there will be an incorrect inference about where the emissions are coming from and how strong they are. Dr. Fischer noted that the plume changed with time and that sometimes the plume is just air coming off ocean, other times it is air that is in contact with California.

Continuing, Dr. Fischer presented a plot combining the emission inventories previously discussed and the footprint function. The purpose is to determine what the concentrations of methane at Sutro Tower will look like as a function of time for the month of July 2004 from the different sources (landfills, livestock, wetlands, natural gas, and radon). There are very low concentrations, with a spike every so often. The reason for this is that most of the time the air coming to Sutro Tower comes off the ocean and contains only background methane. The spikes are due to the footprint having some contact with a land surface where there are emissions from the sources as listed above. The KCRA plot was discussed and it shows a diurnal cycle each day. The KCRA Tower is surrounded by land surface influences and

constantly reads methane from relatively local and regional sources. If the predicted signals are taken and are compared with the signal of estimated radon, for the Sutro Tower, many of the sources have a tight correlation.

In summary, Dr. Fischer stated that California and Bay Area GHG emissions are dominated by CO_2, therefore reductions should start there. Non-CO_2 GHG (methane, N_2O, CH_4, and high GWP) emissions are significant (at the level of 10% of the total emissions currently) and uncertain and beneficial opportunities exist for reduction. Long-term measurements provide an independent and complementary method to verify reductions. The inventories should not be relied on solely, although they need to be done first, but there has to be a way to check them. The initial numerical modeling suggests that the GHG signals are clearly going to be measureable and may provide a strong handle on the emissions. It remains to be seen how much the uncertainties can be reduced. The inverse statistical model will provide a quantitative method to improve the inventories; in particular, assuming an accurate representation of the errors going into the inverse problem can be obtained, there should be an objective way of understanding the errors and the uncertainties in the final emissions. Multiple measurement of multiple tracers are required to more uniquely attribute measured concentrations to a given source estimates. Nested high resolution (approximately 1 kilometer) atmospheric transport models are essential for locations with complicated terrain.

Chair Altshuler recommended that the rate of change be noted in Dr. Fischer's summary (at the second bullet) and stated that while CO_2 is still the largest "piece of the pie," it is also rising. Dr. Bornstein provided additional suggestions, which have been incorporated into the minutes. Chair Altshuler suggested that the Summary page be divided into two pages where the first three bullets would be on the first page as a policy perspective and the last four bullets are more the science and how to get there.

Saffet Tanrikulu, Research & Modeling Manager, stated that CO and CO_2 are already included in the District's modeling exercise. Methane is not explicit so the District can look at CO and CO_2 concentrations through the simulation. Dr. Bornstein noted that the CO_2 estimates were for more traditional air quality and may not capture other sources as discussed at today's meeting. Dr. Tanrikulu stated that Dr. Bornstein's statement is true, partly because CO_2 is not a strong precursor for ozone and the focus has been on ozone and PM.

Dr. Fischer commented that the District's modeling could include CO_2 from fossil fuel combustion. It will be increasingly important and it is currently an area of active research to understand the uptake of CO_2 and the release of CO_2 from the terrestrial biosphere; that is plants growing and dead organic matter decaying.

Mr. Altshuler stated that there is some radon in natural gas and that the amounts differ depending on where the gas comes from. There is more radon in California gas and Dr. Fischer noted that if the gas travels, even for a couple of days, to get to California than some radon will be lost to natural decay.

Dr. Fischer stated that if a lot of fuels are shifted to a plant based source; radio carbon cannot be used as a unique tracer of that fuel combustion.

Dr. Fischer highlighted the further work to be done and stated that the first step would be the concentration measurements of GHGs at Sutro and Walnut Grove Towers, which information

will be available later in the year. Another item being worked on is an upgrade of the meteorological modeling in collaboration with other groups to include the nested grids. Developing and testing high resolution meteorological fields for tower sites using MM5 and Weather Research Forecast (WRF) model outputs. Further work also includes incorporating the additional tracer and species for source attribution analysis. Finally, to initiate inverse model-data-synthesis estimates of regional GHG emissions and uncertainties.

Chair Altshuler thanked Dr. Fischer for his presentation.

5. **Discussion and Summary of Issues Related to Global Warming:** *Committee members discussed issues related to energy and global warming.*

Chair Altshuler initiated the discussion and asked for suggestions on key points the Committee could discuss in the coming year. Chair Altshuler stated that Dr. Fischer talked about the bookmarks and the non-CO_2 gases. He noted that there has been a strong message regarding ethanol not being the "cure all" for climate change. At the September 21st Climate All Stars conference it was recommended that everyone stop burning coal.

Suggestions from the Committee included the following:

- Focusing on policy levers that the Air District may or may not have control over.
- Trying to narrow it down to what does it mean for what the District is doing and how does it relate to the Air District's air quality planning efforts.
- A summary of the technical information the Committee has heard is useful in terms of the state of the science, but it should be narrowed down to what is the Air District's day-to-day practice.

Henry Hilken, Director of Planning, Rules and Research Division, interjected that in terms of the Air District's Climate Protection Program, one of the key points is harmonizing everything the District is doing already – the traditional air quality programs with climate protection. Identifying areas where the District's air quality monitoring could incorporate some impacts of climate change. On the policy side, it would be what the District does about it and looking at co-benefits of mitigation strategies.

Additional discussion items included:

- Possible discussion on how the state incentivizes energy or fuel use – this would give the Committee a few more levers to try to put into play if the Committee does not mind making recommendations that are not strictly the scope or charter of the Air District.
- Things that would incentivize different fuel choices, wind energy or efficiency moves that could be made at utilities or at the user end. This one done on the smog check program.
- The Committee could be broad in that respect.
- Some of the things that work just for the Bay Area are things that need to be done on a state-wide level and might not be able to be done in the Bay Area without legislative interaction.

- The last 3 to 4 speakers have provided a lot of technical information and a summary of their presentations would be useful.
- One of the findings to be able to make is the sources that the District has concentrated on in order to address ozone
- The appropriate sources for GHGs as far as the Bay Area is concerned.
- Agricultural emissions and emissions from combustion sources
- Looking at the sources of methane that the Air District might have some influence over; landfill is one, other methane from natural gas methane.
- Looking at an action that will cause an unintended consequence and looking at actions that have cumulative good consequences.
- Energy conservation solving a lot of pollution problems in addition to a lot of climate change issues.
- Black carbon.
- Focus on CO_2 as the gas that should have the most concern and continue supporting research to make sure that that is the most effective way.
- MTBE-type issues should be flagged. Ethanol is getting close to that; in particular the health effects.

Dr. Bornstein recommended that the Committee members prepare a list in advance and bring it to the next meeting. The final list could be divided into recommendations that would go to the other Committees.

6. **Committee Member Comments/Other Business.** Dr. Holtzclaw thanked Chair Altshuler for an interesting meeting and for keeping the Committee on track this year.

7. **Time and Place of Next Meeting**. 9:00 a.m., Monday, December 10, 2007, 939 Ellis Street, San Francisco, CA 94109.

8. **Adjournment.** 11:40 a.m.

Mary Romaidis
Clerk of the Boards

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
Memorandum

To: Chairperson Kurucz and Members
of the Advisory Council Technical Committee

From: Mary Ann Goodley
Executive Office Manager

Date: January 31, 2008

Re: Synopsis of January 9, 2008 Advisory Council Meeting/Retreat

Per your request, the following is a synopsis of the Advisory Council Meeting/Retreat for your discussions.

Chairperson Kurucz, of the Technical Committee provided the Council with a report and it was decided that many of the ideas are interlinked and the Committee will put them together and come up with one large topic that will be investigated in-depth and will include the following:

- Implications of Climate change; the synergies and conflicts of climate change and criteria pollutants; and
- Implications of fuel choice.
    - Multi-pollutant; multiple scale models, which are known as integrated multi-pollutant management (as this will be the focus)

Meetings will be held in general the first Mondays at 9:30 a.m., with an alternate of meeting the second Mondays (where there are conflicts).

Chairperson Kurucz noted that speakers were selected. There are five members on the Committee at present. Chairperson Kurucz also stated that if the topic is of interest to members, one more committee member is needed.

The speaker list discussed included the following:

- Mike Kleemin – UC Davis; looking at the Implications of Climate Change on Particulate Matter (PM);
- Speaker from EPA – that can research Triangle Park; on single models and multi-pollutant models; multiple scale;
- Livermore Labs – Regional Climate Change Impacts; and
- Rob Harley – Effects of Climate Change on Ozone Strategy

Chairperson Kurucz indicated that Mr. Harley would perhaps be someone that would be of interest generally, to the entire Council.

The expected outcomes would be a synthesis of what is heard from the speakers and the knowledge of the Committee members; so more or less implications of climate change on Bay Area air quality programs. That may be an early agenda item and then it would also be an agenda item at the end of the year.

Respectfully,

Mary Ann Goodley
Executive Office Manager