Southern Oregon Climate Action Now
SOCAN
Confronting Climate Change
http://socan.info

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April 10th 2015
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Honorable Jessica Vega Pederson, Chair, House Committee on Energy and Environment
Honorable Members of the Committee
900 Court Street NE, Room 347,
Salem, Oregon 97301
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Colleagues:

As President of the Board of Directors, I write on behalf of the 650 plus concerned residents of Southern Oregon who are Southern Oregon Climate Action Now (SOCAN). I wish to address the series of bills that are before the Oregon House Committee addressing our need to limit greenhouse gas emissions in the state (HB2082, 2159, 3250, 3252, and 3470) and explain why SOCAN is endorsing HB3470.

Please see attached testimony.

I have prepared this testimony in two sections:

The first section contains a series of 'brief summary points' leading to the recommendations.

The second section provides an 'expanded commentary' where paragraphs follow the same numbers as in the brief summary points. This section is followed by sources cited.

I am sending this to our regional Southern Oregon representatives and members of the Oregon House Energy and Environment Committee. Each will be accompanied by the appropriate Bullet List and the Summary from our SOCAN Legislative District Project which identify district climate trends, along with projections and probable consequences.

Thank you for your time and consideration.

Sincerely

Alan R.P. Journet Ph.D.
President, Board of Directors
Southern Oregon Climate Action Now

Southern Oregon Climate Action Now Testimony to House Energy and Environment Committee Regarding HB2082, 2159, 3250, 3252, and 3470

Submitted by Alan Journet Ph.D. on behalf of SOCAN

Qualifications for Comments:

Following 30 years teaching and researching in ecology and environmental science during the course of which I became increasingly concerned about global warming and it potential ecological impacts, I retired from Southeast Missouri State University and relocated to Southern Oregon where I co-founded, with a group of local residents Southern Oregon Climate Action Now, a grassroots, all volunteer organization comprising over 650 concerned residents. I now serve as President of the Board of Directors, Co-facilitator, and Chair of the Government Group which has spent time evaluating the host of bills before the Oregon House Energy and Environment Committee addressing greenhouse gas emissions limitation. It is on behalf of the organization that I submit testimony regarding HB2082, 2159, 3250, 3252, and 3470 explaining why SOCAN supports HB3470.

1 - Brief Summary Points:

The Problem:

1) That global warming is happening and human emissions are contributing is unequivocal.

2) Under a 'business as usual scenario' by 2100 temperature rise across Oregon will likely range from 8 to 10°F, a rise that will decimate Oregon's natural, agricultural, and forestry systems.

3) Individual action is a necessary but insufficient response; we need governmental action at all levels.

4) Achieving the internationally agreed target of a 3.6°F global temperature rise above pre-industrial levels will require substantial effort since we are already committed to 4/5th of that rise from what we have already emitted.

5) While federal action would be preferable, in its absence, state action is necessary.

The Cause:

6) Knowledge of greenhouse gas impacts is two centuries old. Indeed, it is thanks to these gases that the planet can support life. Since the industrial revolution carbon dioxide has increased 45%, methane about 7-fold, and nitrous oxide about 3.5 fold.

7) Compared to the global warming potential of carbon dioxide, designated as 1, methane and nitrous oxide have far greater warming impacts. Thus, their potential contribution should be

accounted in any program designed to address greenhouse gases and curtail global warming.

8) These three global warming culprits are the dominant 'greenhouse gas (GHG).' Their impact is assessed as a comparison to carbon dioxide (arbitrarily designated as 1). This value is often therefore defined in carbon dioxide equivalents (CO_2e).

9) Our current emissions trajectory will result in our having exhausted our emissions allowance by 2032 if we wish to remain below the agreed by 2032 3.6°F limit. There is, therefore considerable urgency associated with acting to address these emissions.

10) Carbon dioxide and nitrous oxide emissions resulting from fossil fuel combustion are relatively easy to identify and quantify. Methane emissions, however, result largely from unplanned leakage – known as fugitive emissions. Because of the high GWP for methane, not much leakage is necessary before the combustion benefits of this fuel compared to coal and oil are negated. Much recent evidence suggests that leakage has been vastly underestimated by the EPA, and particularly for natural gas obtained from hydraulic fracturing (fracking) shale is always above the cut-off value. As a result, shale fracked natural gas is always worse than coal in terms of greenhouse gas impact. In order to determine what the leakage rate is, a full life cycle analysis of emissions from extraction to combustion must be undertaken.

The Solution:

11) Two approaches have been developed to stimulate reduction in greenhouse gas emissions: placing a tax or fee on the emissions, or capping the emissions. In 2007 Oregon established through legislation climate pollution reduction goals. Unfortunately, because the state is not currently on a trajectory to achieve the 2020 goal, more aggressive measures are necessary.

12) Given the preceding points, it is critical that to be successful, any program developed to reduce greenhouse gas emissions must both address all greenhouse gases, not just carbon (or carbon dioxide) and must incorporate complete life cycle analysis of emissions.

Assessing the Options – Critical Questions:

Greenhouse gases and life cycle analysis

13) The above discussion raise two questions:
    i- Does the proposal address greenhouse gases measured in carbon dioxide equivalents or does it just address the one global warming gas carbon dioxide (or worse, just carbon) while missing other serious warming gases?
    ii- Does the proposal incorporate a complete analysis of the full life cycle emissions or does it target only combustion emissions, missing fugitive emissions resulting from leakage?

Biomass and Biofuels

14) Although burning biomass releases carbon dioxide only recently trapped, and this is again trapped by photosynthesizing plants, this may take decades. Regrettably, the urgency that confronts does not permit us the luxury of accounting over decades.
15) Additionally, an accurate accounting of the greenhouse gas benefits or costs of biomass burning will include full life cycle assessment of emissions resulting from harvest, transport, and processing of the biomass.
16) Finally, the Energy Returned of Energy Invested for biofuels is so low that almost as much energy is expended producing the fuel as the fuel contains. Since that energy is usually derived

from fossil fuels, vast greenhouse gas emissions are likely a consequence of producing the biofuel.

iii Does the proposal target all forms of fuel employed in the economy that emit greenhouse gases with no exemption for non-fossil fuels?

Social Justice

17) Taxing or capping greenhouse gas emissions may penalize low income earners more that high income earners

iv Does the proposal provide a mechanism to redress hardships imposed on low income earners?

Current Science

18) The example of our recent discovery of the existence of substantial methane leakage illustrates the need to insure that monitoring includes assessment of the best current scientific knowledge.

v Does the proposal provide a mechanism to ensure current science is incorporated into the conduct of the program?

Conclusion– Recommendations – Benefits

19) On behalf of the 650 plus concerned residents who are Southern Oregon Climate Action Now the Leadership has examined the six bills offered this session to address the problem of greenhouse gas emissions, and developed the following position with respect to the bills:

20) While imposing a Fee on carbon dioxide equivalents with a Dividend returned to all taxpayers was popular, SOCAN offers our collective support primarily to HB3470. Our assessment of the bills against the above criteria also lead us to support the principle of imposing a cap rather than a tax or fee, especially when that tax or fee proposed targets only carbon or carbon dioxide and not the full array of greenhouse gases through assessing carbon dioxide equivalents.

21) Contrary to the claims of naysayers, it is possible for Oregon to promote a 100% renewable economy and save money.

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2 – Expanded Comments

1) Despite what a minority argue, the science on global warming is clear and unequivocal. The planet, including Oregon, is warming and human induced emissions of climate pollution (greenhouse gases resulting from burning fossil fuels) are a substantial contributor to the problem (IPCC 2013a). It is very clear that if we wish to protect the planet for future generations, we must limit our combustion of fossil fuels.

2) Projections for temperature rise across the state suggest an increase by the end of the century ranging from some 8°F at the coast to 10°F inland. Such a temperature rise is almost certainly beyond the ability of our natural, agricultural, and forestry systems to tolerate. If we do not collectively address this trend, the pattern will continue and become even worse beyond that time.

3) If we wish to leave for our children and grandchildren a region and planet that are livable we have a duty to address this problem. While individual action can have an impact if sufficient of us engage in profound behavioral changes, this will be insufficient; the dimensions of the problem are simply too enormous for us to make substantial inroads through individual action. What we desperately need are government actions and international agreements.

4) Multiple international agreements and sources have agreed that the limit beyond which it would be extremely dangerous to allow global warming to climb – assuming we wish to protect our natural, agricultural, and forestry systems for future generations - is 3.6°F above pre-industrial levels. Regrettably, as can be seen below we are well on the way there. Indeed, if we combine the historical rise with the future rise locked in by emissions already released, we find we are already some 4/5ths of the way to this limit. Sanity demands that we undertake those steps necessary to curtail the rate of increase and avoid that limit and do it as a matter of urgency.

5) Although federal action to address this problem would be preferable to state action, unfortunately it is evident that too many of our elected representatives in Washington are simply not prepared to take the necessary steps. This means that addressing this problem is left to the states and regions. While a few states, and neighboring nations and provinces are already countering this problem without devastating their economies, by addressing it head-on and developing a state solution, Oregon could still be a national leader and pace-setter in this effort.

The Cause:

6) The evidence that gases in our atmosphere are responsible for our comfortable historic temperature has been mounting since it was first proposed two centuries ago (Ma 1998). We now understand that without these gases, the planet would average about 0°F instead of the 56.7°F of the 1880s and our current 58.1°F (Osborn 2015). Without these gases, life would probably never have arisen. What we have induced since the industrial revolution, when we embarked on an excursion into burning fossil fuels, is a substantial increase in the concentration of several critical atmospheric gases: carbon dioxide has increased from about 275 / 280 parts per million to just about 400 ppm (about a 45% gain), while methane has increased from about 250 parts per billion to nearly 2000 ppb (about a 7-fold gain), and nitrous oxide has increased from 260 / 265 parts per billion to over 1200 ppb (about a 3.5-fold gain)(Karl *et al.* 2009). Nearly 90% of the carbon dioxide increase stems from our burning of fossil fuels (LeQuere *et al.* 2014). Meanwhile, the methane concentration increase is influenced directly by our natural gas and petroleum systems and indirectly by the global warming increasing the rate permafrost thawing and methyl clathrate escape. Finally, the nitrous oxide increase results mainly from agriculture and soil management, with substantial contributions coming from transportation and stationary sources of fuel combustion (IEA 2011).

7) The problem, then, is a function mainly of carbon dioxide emissions, but these are augmented by methane and nitrous oxide. The problem with these other gases is that they have, pound for pound, a far greater impact on global warming that does carbon dioxide. Indeed, because its longevity in our atmosphere is much shorter than carbon dioxide, methane is acknowledged to have a Global Warming Potential 34 times that of carbon dioxide on a 100 year comparison, and 84-86 times worse on a 20 year comparison. Furthermore, the global warming impact of methane was reassessed upwards substantially between the 2007 and 2013 IPCC Assessment Reports. Nitrous oxides, meanwhile, exhibits a 100 year GWP approaching 300 times that of carbon dioxide. Clearly, relatively low volume emissions of these other two gases can have a profound warming impact and any program designed to address greenhouse gas emissions must take these gases into consideration (IPCC 2013b).

8) These three gases, along with a few others, including some man-made products, collectively fall under the heading known as 'greenhouse gas (GHG).' The global warming impact of a GHG is assessed in comparison to that of carbon dioxide (arbitrarily designated as 1) based on the comparisons identified above. This value is often therefore defined in carbon dioxide equivalents (CO_2e) (EPA 2013).

9) The best available evidence suggests that at our current trajectory of accelerating emissions, if we wish to remain below that 3.6°º limit, we will have exhausted our allowance for carbon dioxide equivalent emissions by about 2032. This tells us that we need to have this problem solved by the time current one year old children earn the right to vote. (Bagley 2014, Le Quere *et al.* 2014, Meinhausen *et al.* 2009, Quick 2014)

10) Since it results from combustion, the source of carbon dioxide and nitrous oxide emissions from fossil fuels is rather easy to identify. Methane emissions from natural gas, however, are somewhat more difficult to assess. This is because these emissions result not from the combustion of natural gas, which produces carbon dioxide, but from leakage. What was

unknown until somewhat recently, is that methane leaks throughout the extraction and transmission of natural gas. Although natural gas combustion indeed results in less carbon dioxide emission per unit of energy generated than does burning coal or oil, because of its higher Global Warming Potential, not much methane leakage is necessary before that benefit is negated. Recent analyses, indicate that the EPA has substantially underestimated methane leakage (Miller *at al.* 2013). Meanhile, other recent studies, such as those of Howarth and colleagues (summarized in Howarth 2014, but see also Karion *et al.* 2013,) suggest that natural gas resulting from hydraulic fracturing (fracking) of shale deposits results in methane leakage ranging from 3.6 to 7.9% of the resource. If leakage is very small, burning natural gas can still be less damaging than burning coal, but once this leakage crosses 2.8%, natural gas is worse than coal. As can be seen, Howarth suggested that shale fracked natural gas leakage is always greater than this cut-off, making this energy resource always worse than coal. This problem illustrates clearly why assessing the global warming impact of a given fossil fuel cannot be undertaken adequately without performing a complete extraction to combustion (cradle to grave) life cycle analysis of emissions (Bradbury 2013). Assessment only of combustion emissions is inadequate.

The Solution:

11) What we need to do, quite simply, is curtail our use of the fossil fuels that result in these emissions. Two successful approaches have been taken to addressing the task of reducing Greenhouse gas emissions, approaches that incorporate market principles: one involves placing a tax or fee on fossil fuels in accordance with the greenhouse gases they release; the other involves setting a cap on the gases that can be annually emitted in a jurisdiction (Goulder and Schein 2013). This goal was recognized in passage of House Bill 3543 in 2007 which established targets for emissions reductions (OGWC 2009). Unfortunately, the state is not currently on a path to achieve those goals (PUC 2014). More aggressive efforts to reduce climate pollution are necessary.

12) It is critical to appreciate that – given the discussion above – a successful program designed to recue greenhouse gas emissions will target greenhouse gases assessed in carbon dioxide equivalents. Failing to accept this target will result in, or even encourage, emissions of other gases that can contribute more to the problem than carbon dioxide. Failing to target greenhouse gases, and just targeting carbon dioxide, for example, can stimulate the use of natural gas which, because of the fugitive emissions disused above, can be worse than coal in promoting global warming. Similarly, a successful program will target methane leakage by incorporating complete life cycle analysis.

Assessing the Options – Critical Questions:

Greenhouse Gases and Life Cycle Analysis:

13) The arguments presented above lead to the first pair of questions that should be applied to any proposed remedy:

    i Does it address greenhouse gases measured in carbon dioxide equivalents or does it just address the one global warming gas carbon dioxide (or worse, just carbon) while missing other serious warming gases?

ii Does it incorporate a complete analysis of the full life cycle emissions or does it target only combustion emissions, missing fugitive emissions resulting from leakage?

Biofuels and Biomass:

14) It has been argued that using biomass as a feedstock for large scale commercial generation of electricity is harmless since the carbon dioxide released by burning this resource represents carbon dioxide trapped from our recent atmosphere rather than an atmosphere hundreds of millions of years ago. Furthermore, the argument continues, this released carbon dioxide will be absorbed by plants in the near future as they grow and photosynthesize, thus negating the emissions. This argument assumes that the decades that this cycle may take to complete is a short enough time for emissions to be irrelevant. Unfortunately, what we know is that the length of time within which we must act to address this problem is far too short for such a time scale to be acceptable; we do not have decades to address this problem, we must address it now. This concern, it should be stressed, does not refer to domestic use of biomass for home heating since that can be a highly efficient or forest management designed to reduce fire risk.

15) In determining whether commercial biomass combustion comprises an advantage compared to fossil fuels, it is necessary to undertake a complete life cycle analysis of the emissions resulting from the harvest, transport, and processing of that biomass. To this equation, should be added the cost of lost carbon sequestration potential associated with harvesting growing biomass.

16) Additionally, the argument that biofuels manufactured from plant material by such processes as fermenting, for example, are an acceptable alternative to fossil fuels fails to recognize that such biofuels have among the lowest Energy Returned on Energy Invested (EROEI) of all fuels – mostly barely breaking above 1:1. The energy consumed in the production of these biofuels almost always is derived from fossil fuels, so allowing biomass and biofuels an exemption potentially also exempts the emissions resulting from the fossil fuels burned in the production and processing of those biofuels.

This consideration leads to a third criterion:
iii Does it target all forms of fuel employed in the economy that emit greenhouse gases with no exemption for non-fossil fuels?

Social Justice:

17) There is abundant evidence that imposing a cap or a fee on the use of fossil fuels because of the greenhouse gas emissions resulting from their use has the potential to impact low income earners relatively more than high-income earners. It seems just, therefore, that whatever approach is taken should take this into account and offer compensation of some kind for those segments of our society most challenged by the mechanism.

This consideration leads to a fourth criterion:
iv Does the proposal provide a mechanism to redress hardships imposed on low income earners?

Current Science:

18) The recent realization that substantial leakage of methane in the production and transmission of natural gas is perfect testimony to the need for maintaining attention to current science in the conduct of whatever program is proposed.

This consideration leads to a fifth criterion:

v Does the proposal provide a mechanism to ensure current science is incorporated into the conduct of the program?

Conclusion – Recommendations – Benefits

19) On behalf of the 650 plus concerned residents who are Southern Oregon Climate Action Now the Leadership has examined the six bills offered this session to address the problem of greenhouse gas emissions, and developed the following position with respect to the bills.

20) While imposing a Fee on carbon dioxide equivalents with a Dividend returned to all taxpayers was popular, SOCAN offers our collective support primarily to HB3470. Our assessment of the bills against the above criteria also leads us to support favor both bills imposing a cap rather than either the tax or fee approach, especially when that tax or fee proposed targets only carbon and not the full array of greenhouse gases through assessing carbon dioxide equivalents.

21) Our reliance on conventional fossil fuels results in a considerable Oregon injection into the economies of neighboring states. Several years ago, Jacobson and Delucchi (2009) demonstrated that the planet could be powered 100% on renewable energy by 2030. Since then, Jacobson has developed proposals demonstrating how each state in the U.S. can achieve such a goal (http://thesolutionspeject.org). The bottom line: contrary to repeated claims of naysayers, this is possible. The plan would create 37,000 long term construction and 20,000 operation jobs, avoid $3.7 billion in health costs, reduce future (2020-2030) energy costs per KWh nearly 70%, and reduce individual expenses some $10,00 annually (TSP 2015).

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