BEFORE THE PUBLIC UTILITY COMMISSION
OF OREGON

LC 66

In the Matter of	)	
	)	INTERVENOR FINAL
PORTLAND GENERAL ELECTRIC	)	COMMENTARY
COMPANY,	)	
	)	
2016 Integrated Resource Plan	)	

Intervenor: Edward Averill, Representing
NW Climate Methane Task Force

RESPONSE TO "STAFF REPORT FOR THE AUGUST 8, 2018 PUBLIC MEETING"

We find that Staff analysis is properly concerned with strict adherence to formal IRP Guidelines, and that departures from the Guidelines elected by PGE have been thoroughly audited and accurately interpreted.

The need to withhold acknowledgment of certain elements in the subject IRP is justified by Staff's extensive narrative laying out technical and administrative rationale. Our concern for Commission guidelines involving environmental externalities, addressed in our initial filing, nevertheless remains. PGE planning skirts the PUC environmental caveats at the same time Commission Staff sets these aside. We would find this acceptable if the climate impacts of pervasive releases of methane pollutants were a contentious political distraction.

We believe the established science of dangerous methane properties is beyond credible political or scientific question. Moreover, military analysts for have acknowledged the corresponding threats for decades, recently describing pollutant-driven climate change as a threat multiplier. Ref. http://archive.defense.gov/pubs/150724-congressional-report-on-national-implications-of-climate-change.pdf?source=govdelivery

The Commission would continue to defend public interests by emphasizing the cost of utility-sourced pollutants as well as the pervasive releases from its fuel supply infrastructure. Since an investor owned utility defends stockholders, the Commission must remind the utility of due diligence obligations to the public sector, these obligations being written into the terms of the IRP Guidelines. Oregonians are paying for good government and getting it.

The PUC is clearly competent to delineate what it means to engage specific IRP Guidance rules implementing SB 1547 and the carbon budget called for in the 2 Deg C MOU signed by Governor Kate Brown. The public record compiled under LC 66 underscores the need for this authority, given the lengths undertaken by PGE to divert from existing clearly defined IRP Guidelines (such as posing proxy resources and generic capacity, not to mention the subjective metric favoring PGE's preferred fossil fuel solution when fuel-free alternatives are abundant and proven practical in other states).

PGE owes a debt of gratitude to Oregon Legislators for HB 2193, requiring the company to do the right thing by law, and to the Commission Staff for discovering and disclosing weaknesses in utility business planning that are reflected in the open discussion of resource planning. In a climate crisis, the cost to society of existential adaptations could well exceed the cost of carbon fuel shutdown.

Climate leaders including us, and including in today's attachments, have highlighted the significance of energy decisions to be made between now and 2020. The quality of life about to be inherited by youthful Commission Staff who are addressing near term resource planning is at issue.

Ref. https://amp.theguardian.com/environment/2017/jun/28/world-has-three-years-left-to-stop-dangerous-climate-change-warn-experts

Tera Hurst
reneworegon.org

Ed Averill

I wrote you a couple of weeks ago and said, “Oregon has **never been closer** to transforming our state to a clean energy economy.” The next big step is putting a price on pollution. And I’m now happy to write to tell you we’ve never been closer to that goal than we are now.

Governor Kate Brown says “*We must pass the Clean Energy Jobs bill in 2018. The world should know, Oregon and the rest of the nation are going to keep moving forward to tackle climate change.*”

She wants us to pass the *Clean Energy Jobs* bill in 2018 and she wants Oregonians’ help to do it! If that’s not a call to action, I don’t know what is. **Let’s show the Governor when she stands up for the climate, we’ve got her back!**

Will you send a quick note to Governor Brown to tell her you support bold climate action now? Click here. It only takes a few seconds and makes a world of difference.

Thirty-three Oregon representatives and senators have already signed on to co-sponsor the *Clean Energy Jobs* bill. The Speaker of the House and Majority Leader Williamson both said they'll be pushing for *Clean Energy Jobs* next session. **Can you feel the momentum building?!**

At Renew Oregon, we're not slowing down for summer; we're speeding up. We're fanning out to every corner of the state to organize people. We're adding support from more businesses, farms, congregations, community groups, and hundreds of Oregonians to our campaign each week. See you out on the campaign trail!

Tera Hurst
Executive Director
Renew Oregon

Other leaders sound off on *Clean Energy Jobs.*

"We've worked hard and learned a lot this session about how Oregon can effectively cap and price climate pollution," said **Representative Ken Helm**, who chairs the House Energy and Environment Committee. "The *Clean Energy Jobs* Bill is in a good place after months of work. We'll take the summer and fall to refine the details and find the most effective ways to invest in Oregon communities and reach those in need of increased opportunities, jobs and clean energy. The policy will be ready for next year."

"It's time for us to continue our pioneering ways by taking the lead in battling climate change," said **Senator Michael Dembrow**, who chairs the Environment and Natural Resources Committee. "This isan opportunity to begin showing the people of this state and the rest of the nation that we take this issue seriously. This also is an opportunity to strengthen our state's position as a clean energy leader, creating jobs for Oregonians living in places that need them the most. For too long, there has been a perceived conflict between creating or maintaining jobs and protecting the environment. I think we can do both." an opportunity to begin showing the people of this state and the rest of the nation that we take this issue seriously. This also is an opportunity to strengthen our state's position as a clean energy leader, creating jobs for Oregonians living in places that need them the most. For too long, there has been a perceived conflict between creating or maintaining jobs and protecting the environment. I think we can do both."

Community Action - Climate Risk Response

Community Action - Climate Risk Response

What is the Risk in Oregon ?

OSU Oregon Climate Change Research Institute Testimony to State Senate – one long list of risks:

Search "Oregon Climate 2017 Dalton" for summary and link, rolls up peer-reviewed papers, assessing physical/bio impacts

Coast – flooding, erosion, spawning hurt by estuary overtemps
Willamette Valley – higher temps, floods, water mgt, wild fire
Cascade Range – less snow, more water loss, fires, drought, insects, disease, air quality
Eastern Oregon – water shortage, fire risk, air quality risk, loss of fish habitat, non-native weeds and grasses

Oregon Economic Sectors: The one among many we looked at:

Agriculture – Community Action Risk Analysis
Forestry
Infrastructure
Public health
Outdoor Recreation
Freshwater fishery
Saltwater shellfish

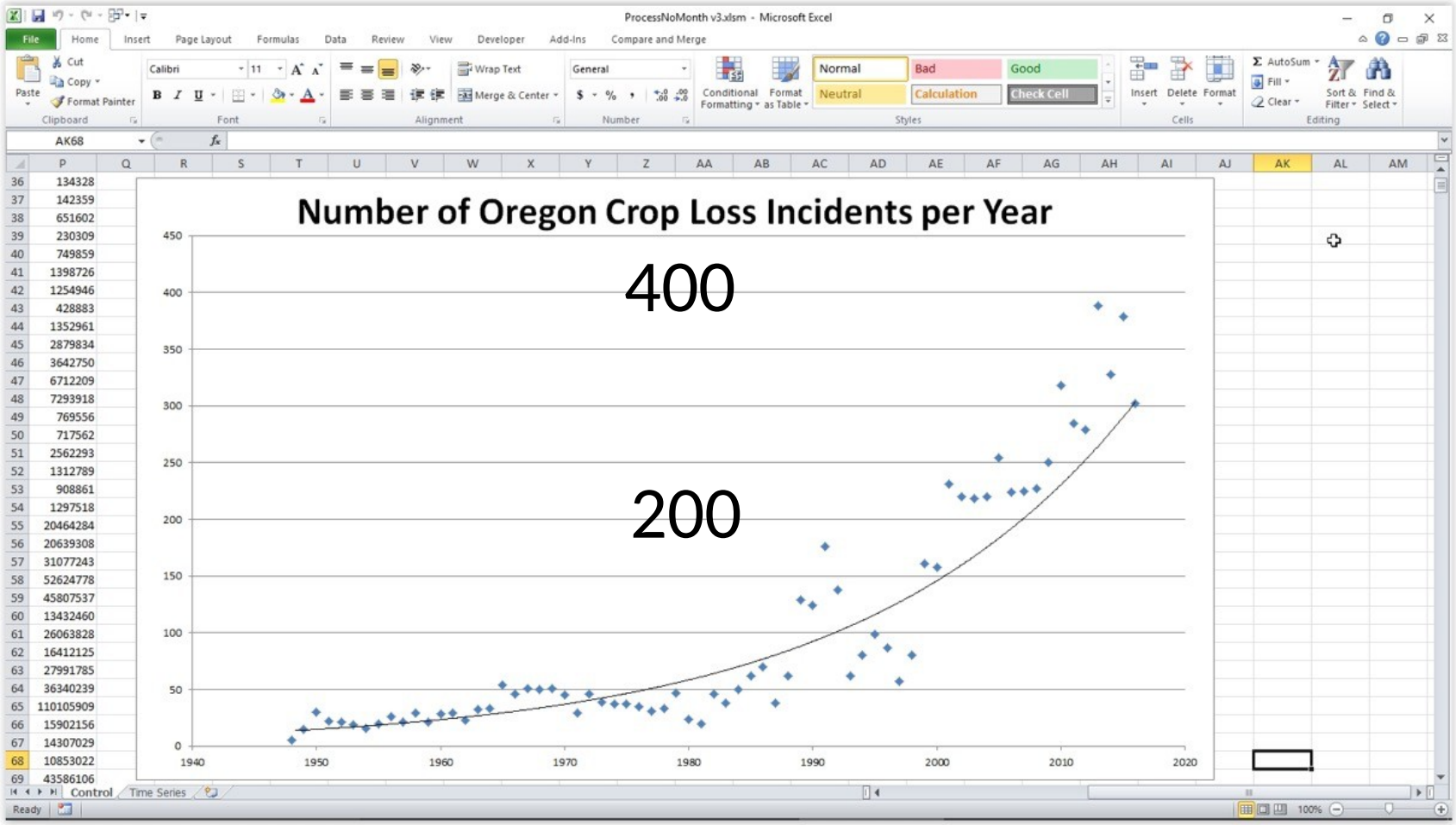
Our Study Results:

History of Crop Failures in Oregon's Second Congressional District Are Impressive in amount and pattern

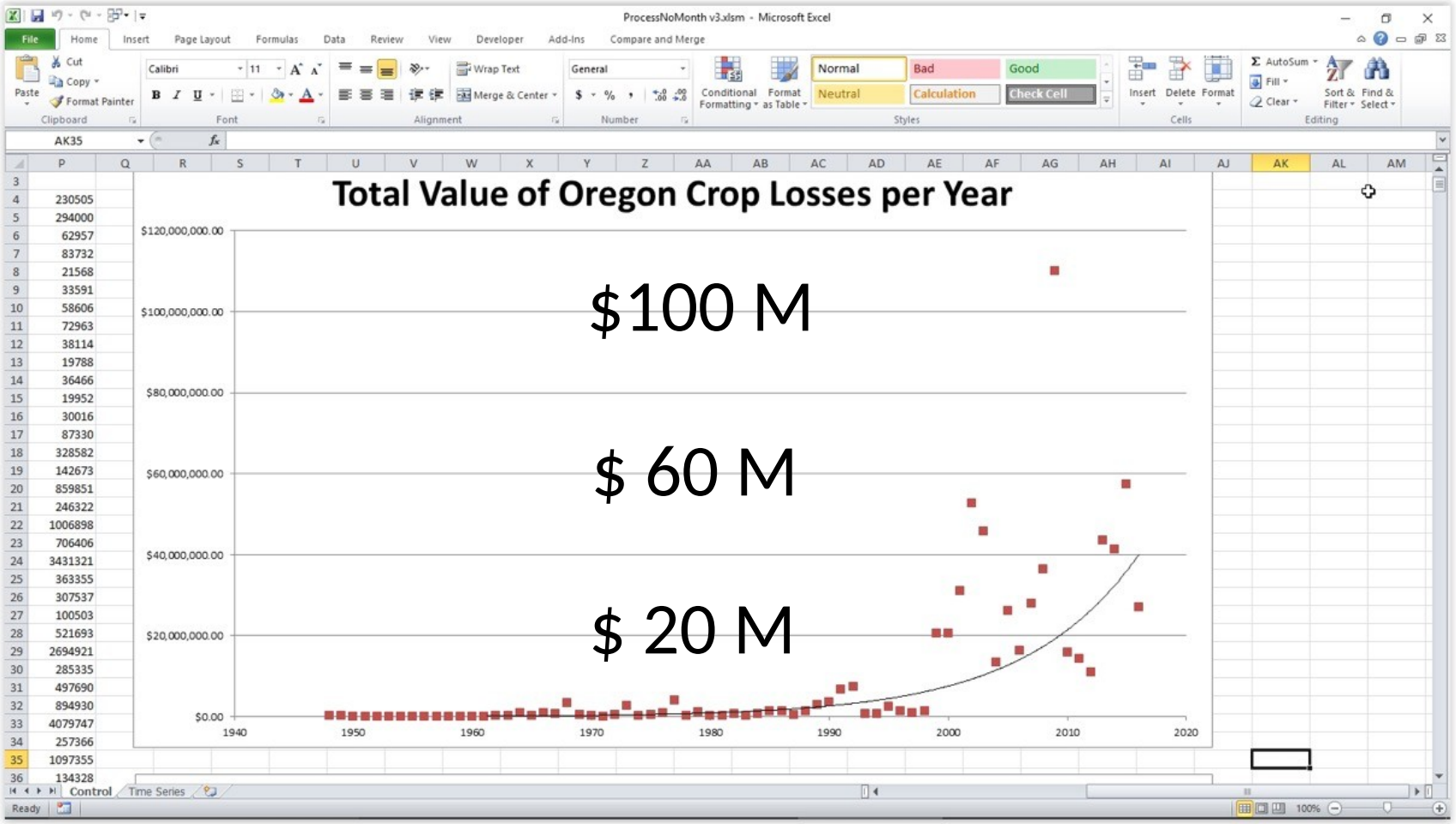
- **Reported by the US Agriculture Department Risk Management Agency (RMA)**
- **Crop Loss Data Tells a Story of "Bad Luck" Since 2000**

USDA RMA Reports Crop Losses

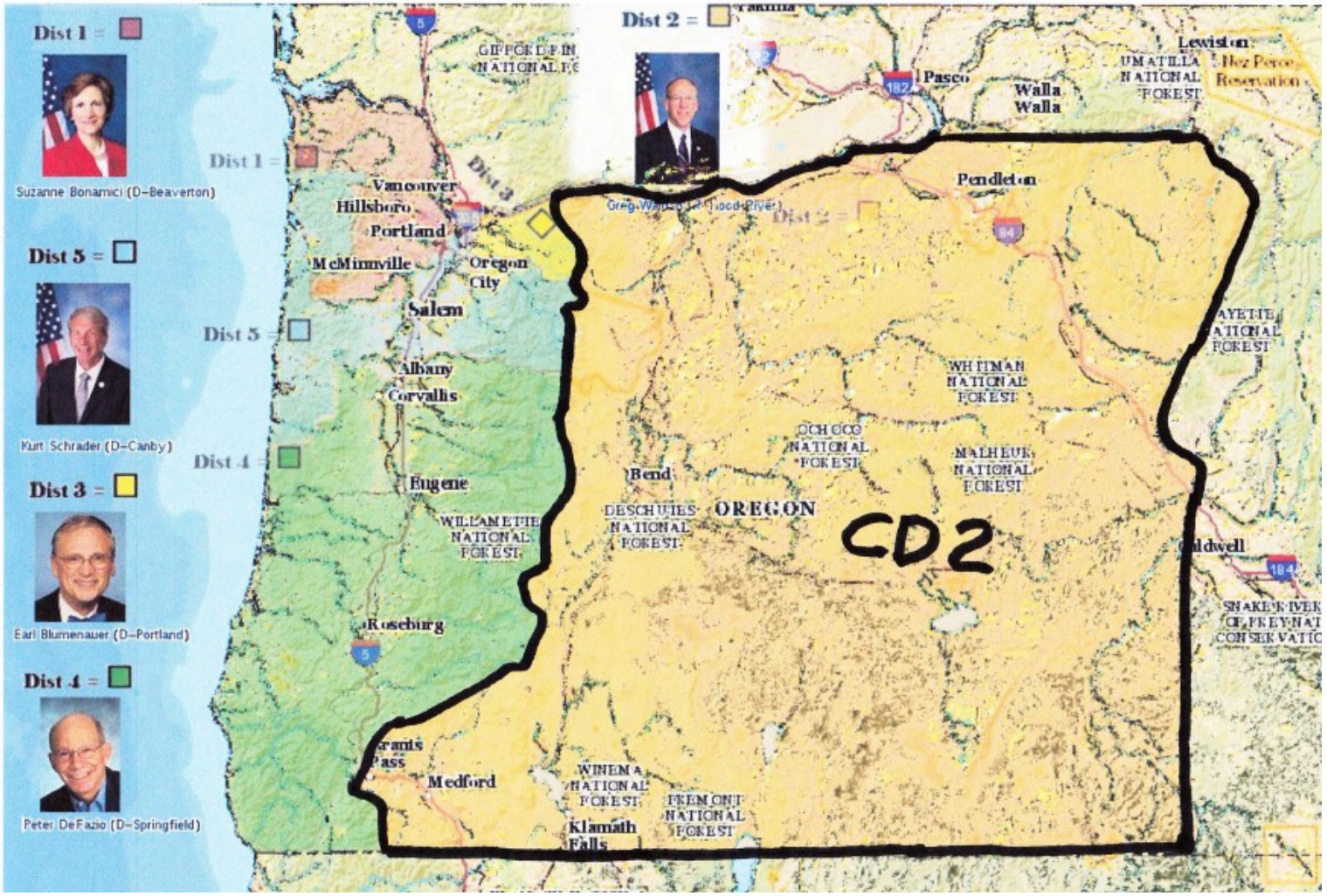
Notice hockey stick upwards curve and increasing scatter for this and following charts.



USDA RMA Reports Crop Losses



USDA RMA Reports Crop Losses



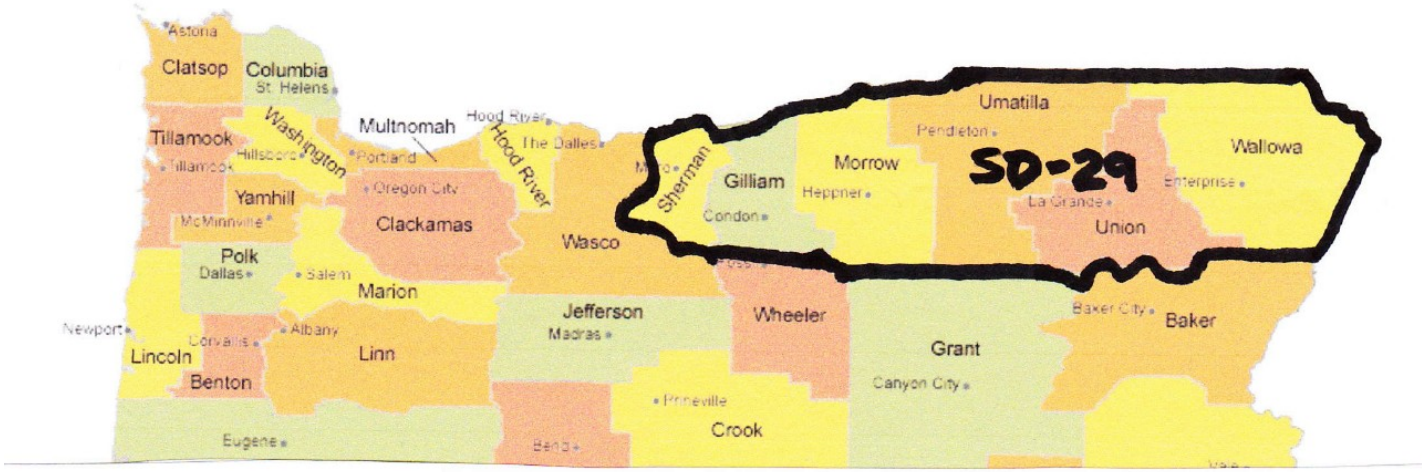
USDA RMA Reports Crop Losses

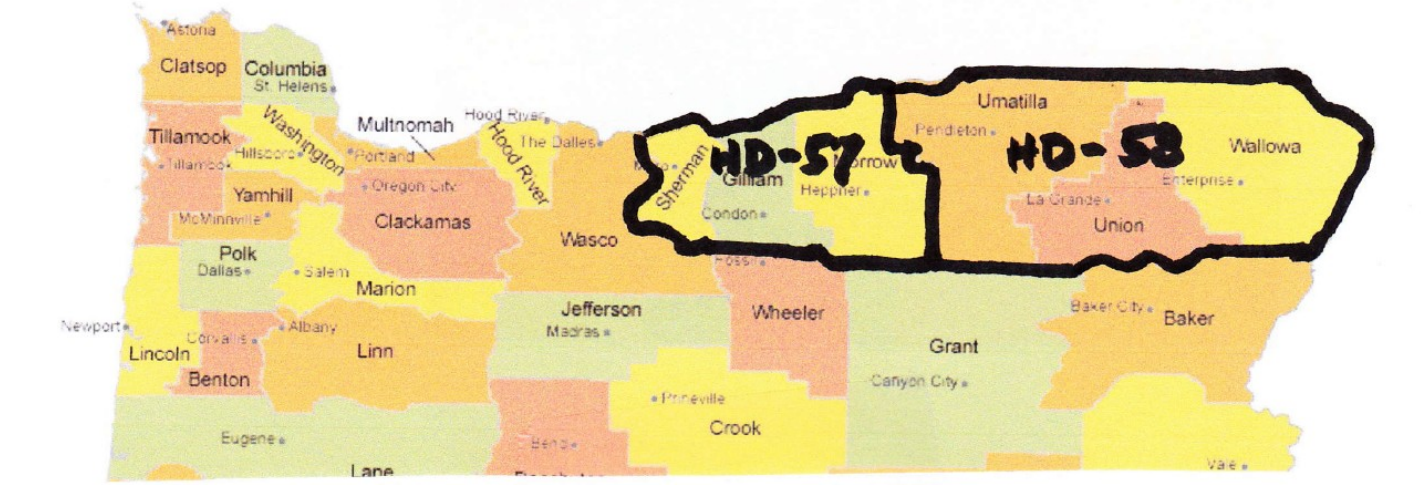
Oregon Crop Loss Data, 1948 to 2016 (68 yrs)

	Total crop loss events	% of Event Total	Total crop loss damage	% of $ loss
Oregon, all counties	7,130	100	$664,622,117	100
Oregon, CD2	6,203	87	$634,696,915	95
Oregon CD2, SD-29*	4,490	63	$553,278,871	83
Oregon CD2, HD-57	2,157	30	$313,201,020	47
Oregon CD2, HD-58	2,926	41	$286,718,285	43

*Sherman, Gillam, Morrow, Umatilla, Union, Wallowa, Senate District 29 (includes House Districts 57 and 58).

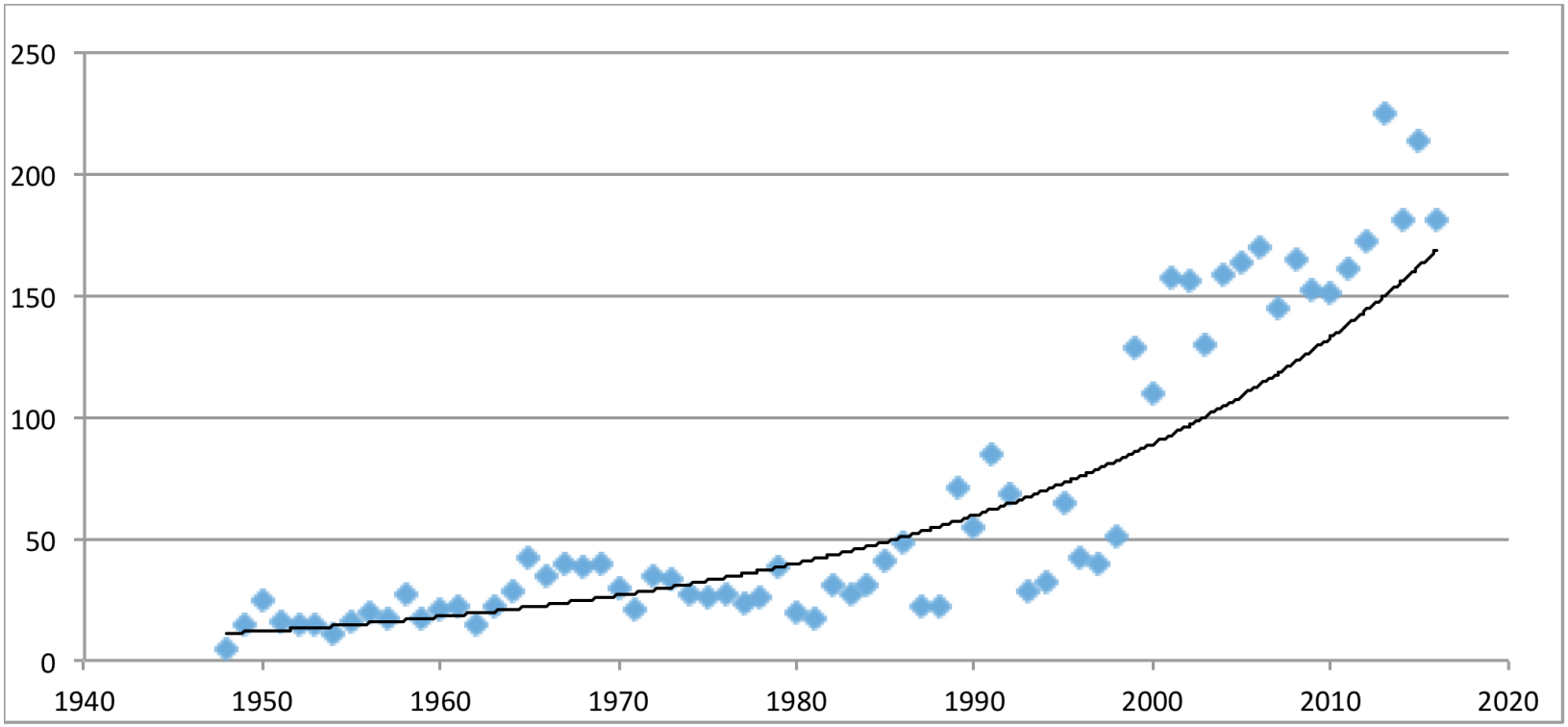
USDA RMA Reports Crop Losses



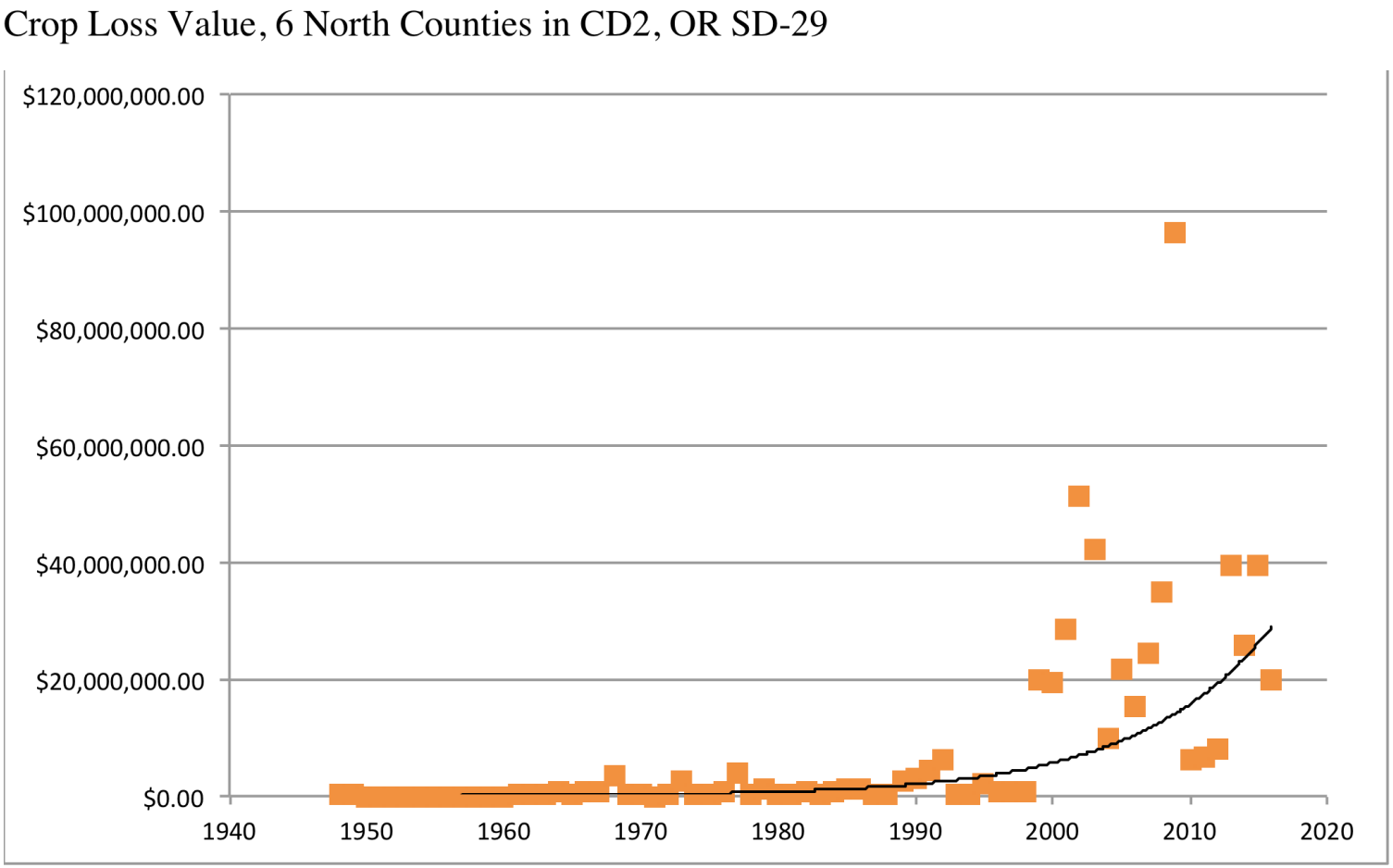


USDA RMA Reports Crop Losses

Crop Loss Events, 6 North Counties in CD2, OR SD-29, Senator Bill Hansell - R

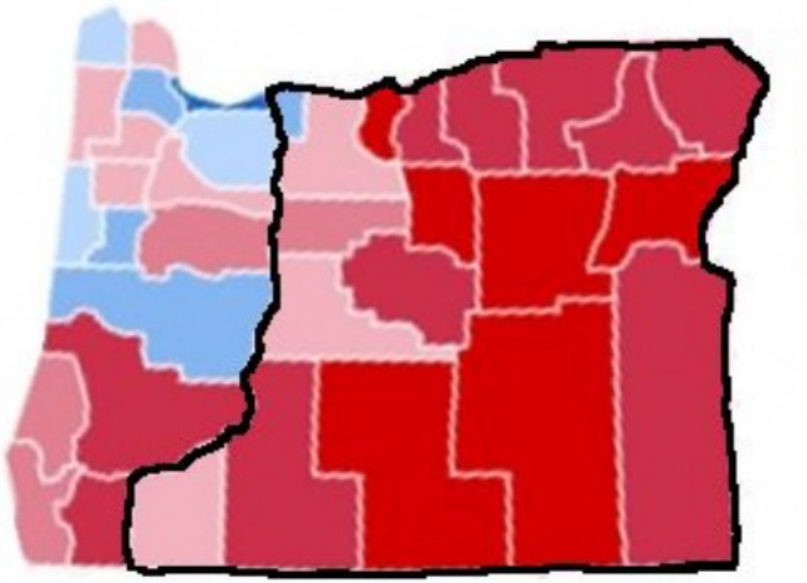


USDA RMA Reports Crop Losses



Where Do Elected Public Servants Care About Climate Change ?

OREGON

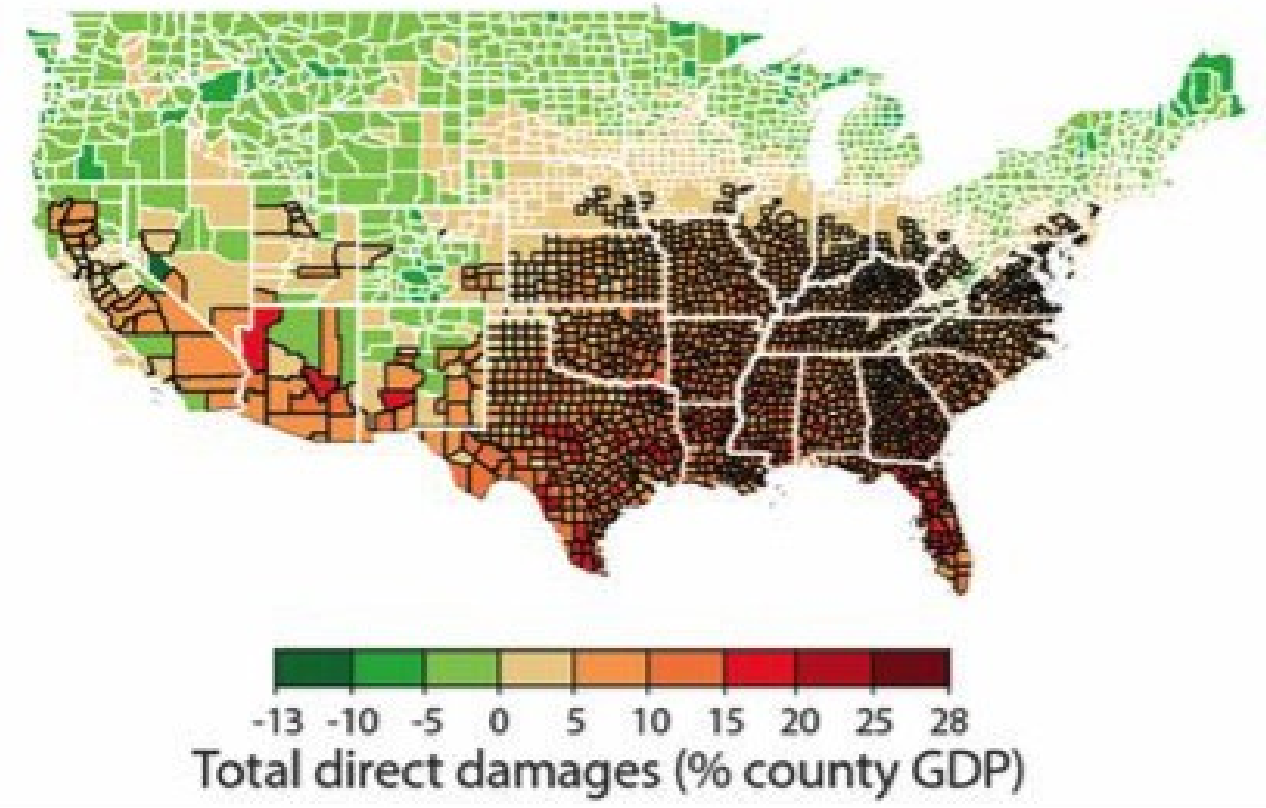


Community Action - Climate Risk Response

What is the Risk in US ?
Another Message to Republican Voters

Country-wide

County-level median damage values, average in 2080
Solomon Hsiang et al. Science 30 June 2017



County-level median damage values, average in 2080
Solomon Hsiang et al. Science 30 June 2017

<u>Additional risks were not considered:</u>

A. Arctic CH4 releases
B. Oceanic food chain collapse
C. Exponential insect spikes (impacting health and crops)
D. Trump-triggered wartime (massive pollutant releases)
E. Extreme weather events outside of modeled trends, with crop damage
F. Warming arctic waters will slow the Atlantic and Pacific circulation currents

Which Oregon business community is acting, to help

Business for Better Portland, The Nature Conservancy, ECONorthwest

To not help,

Associated Oregon Industries, Portland Business Alliance, Oregon Business Assn, Cascade Policy Institute

What elected Dems are doing

Dembrow, AKG, Helm – SB 1070 Clean Energy

This critical bill is targeted for 2018 session, cuts climate risk by cutting Oregon pollutants n% per year

Rep Blumenauer: House Climate Solutions Caucus, Sustainable Energy and Environment Caucus

Sen Merkeley S. 750 Keep It in the Ground, 100% by 2050 Act (w. Sen B Sanders)

Sen Wyden: Chair, Energy and Natural Resources

Reference Charts

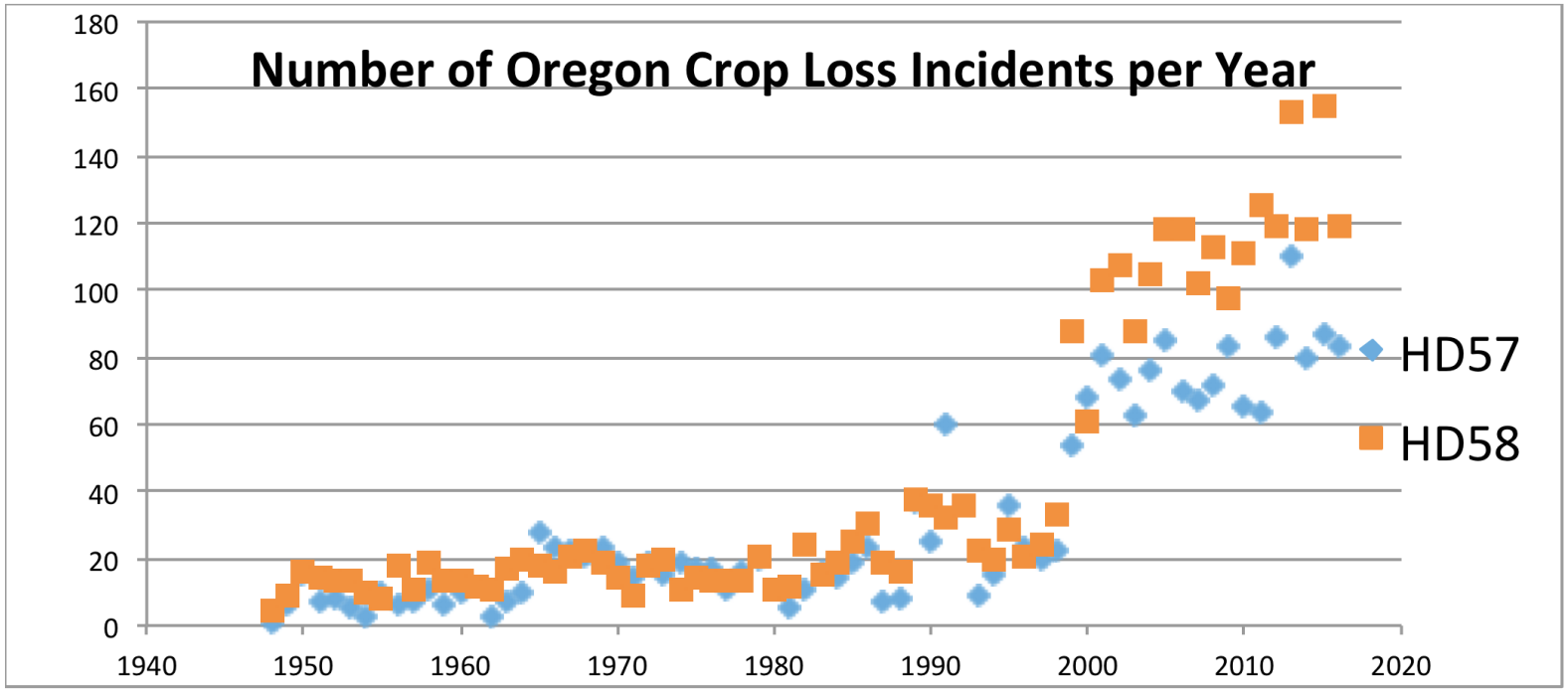
USDA RMA Reports Crop Losses

Congressional District 2 is the largest district in Oregon in terms of land area, and includes a large number of farming and range operators.

- In terms of crop loss events and value of losses, it dominates all other districts
- It encompasses 87% of Oregon crop losses
- It encompasses 97% of Oregon dollar losses

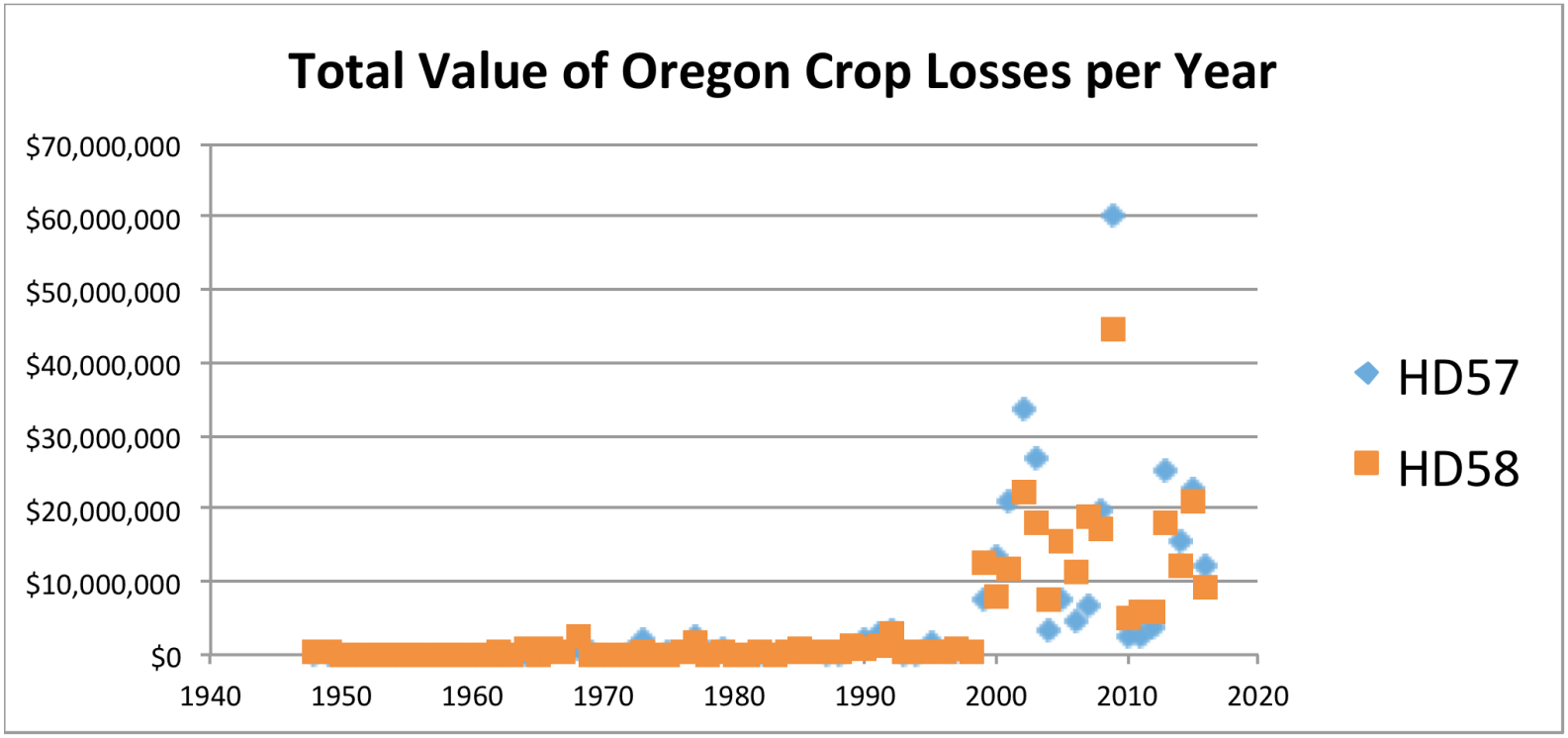
USDA RMA Reports Crop Losses

Crop Loss Events in HD-57 (Sherman, Gillam, Morrow) and HD-58 (Umatilla, Union, Wallowa) reported separately



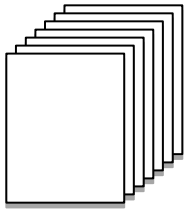
USDA RMA Reports Crop Losses

Crop Loss Values in HD-57 and HD-58 reported separately



Oregon Crop Loss Data to 2016

US Department of Agriculture
Risk Management Agency



Download

Annual crop loss data by state and county since 1948

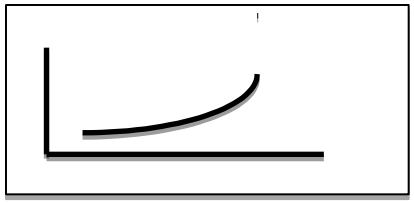
Extract Oregon Data

Oregon

Filter and Aggregate Data

Plot Crop Loss Trends to 2016

By county



Call it Climate Change, Call it Bad Luck, its getting worse

BIOMASS AT BOARDMAN

PGE's Proposal to Convert Oregon's Only Coal Plant into America's Largest Biomass Facility

INTRODUCTION

Before the year's end, Portland General Electric (PGE) will conduct a full day of testing in its coal plant located a few hours east of Portland in Boardman, Oregon, burning wood and energy crops instead of coal. Oregon's largest utility decided to close the Boardman plant when continued operation conflicted with Oregon's shift toward a clean energy future. If the biomass test burn is successful, PGE will consider a full transformation of our state's only coal plant into the largest biomass project in the country.

Figure 1

Facts About Current Facility

-600 megawatt capacity
-Built in 1977, closing in 2020
-Oregon's only coal plant
-Oregon largest CO_2 emitter

Facts About Biomass Proposal

-8,000 tons of torrefied biomass/day
-Full capacity for 5 months/year
-Test burn with 100% biomass before year's end. If successful, PGE will explore permanent substitution.
-This biomass facility would be largest in the Unites States and the largest torrefaction operation in the world.

The term "biomass" can apply to a variety of feedstocks such as forest thinnings, logging waste, mill residue, or short-rotation energy crops. Given the sheer diversity of feedstocks used, any analysis of a biomass facility's environmental impact must consider the specific variables associated with the feedstock it will burn. Therefore, in order to determine the consequences of the unprecedented proposal in Boardman this report includes a careful analysis of the feedstock's life cycle, which considers how the feedstock is grown, harvested, transported, treated, and burned. This analysis finds that PGE's proposal may pose major implications for local air quality, forest health, and carbon reduction goals.

Our key findings include:

-PGE will require about 3.8 million green tons of biomass every year, the majority of which would be sourced from trees on National Forest land.

-Despite claims by biomass advocates, the annual level of wood waste generated by Oregon's timber industry is negligible compared to the feedstock needs of a growing biomass industry.

-Transporting this massive amount of material will require 800 trucks every day, which will not only be logistically complex but will also pose consequences for traffic and carbon emissions.

-An average biomass power plant emits 40-60% more CO_2 than an average coal plant and almost 300% more CO_2 than a new natural gas plant per unit of energy produced.

I. SOURCE OF FEEDSTOCK

Portland General Electric estimates that the 600 megawatt (MW) power plant will require ***8,000 tons of torrefied biomass every day***.[i] Since the treatment, or "torrefaction," of the material will result in a significant loss in mass, PGE will actually need over 12,800 tons of dry material each day. Currently, their proposed plan is to power the facility at full capacity for 5 months every year, which means the plant will need roughly 1.9 million dry tons of unprocessed material each year (or about 3.8 million green tons).[ii]

This tremendous amount of wood and plant-based material will be sourced from a variety of feedstocks in order to maintain a reliable supply chain. Through review of the available literature, interviews, and calculations, it can be concluded that the following feedstocks will provide some percentage of the required fuel for this proposal:

1. Logging Residue and Mill Waste

Proponents of biomass argue that deriving energy from tree and plant-based material holds great potential because the energy sector could utilize timber industry waste that would otherwise remain unused. They claim that large amounts of wood waste are either left on forest floors to rot after logging operations or simply burned off in mills; however, government data shows that the annual amount of unused logging waste and mill residue generated by Oregon's timber industry is negligible when compared to the demand of a growing biomass industry.

Logging residue, also known as "slash", is the un-used woody material left in the forest after a commercial timber operation. Research conducted by the University of Montana conservatively estimates that, on average, about 2.07 green tons of logging residue are generated per one thousand board feet of timber harvested in Oregon.[iii] According to a Forest Service report released in November of 2016, Oregon's timber harvest for 2013 was about 4.2 billion board feet, which means roughly 8.8 million green tons (4.4 million dry tons) of logging residue were generated from commercial timber operations.[iv]

This is not an estimate of logistically or financially available residue, but rather an estimate of the gross amount of residue generated. A host of variables must be considered to ascertain how much of this slash is actually available for Boardman to use as feedstock. About 30-50% of slash must be left onsite for ecological benefits[v] and about half of the left over material is actually not collectable due to logistical complexities.[vi] In addition to these constraints, Boardman's feedstock must be sourced within a 45-100 mile radius and within Oregon borders in order to be economical.[vii] Forests west of the Cascades, where 90% of Oregon's slash is produced[viii] are far beyond this boundary, and the radius itself is cut in half because Boardman is on the Oregon-Washington border. When these factors are considered, it is estimated that ***logging residue could only provide about 6 - 8% (or 110,000 - 154,000 dry tons) of the feedstock the facility will require each year***.

Mill waste is the material left over after a mill processes roundwood into products such as lumber or veneer. Currently, ***over 99% percent of mill waste is already utilized*** at the source by the pulp and paper industry or by mills that burn left-over material to generate modest amounts of electricity for their own facility (usually between 5 and 50 MW).[ix] The scale of demand for mill waste to fuel a stand-alone, utility-scale power plant like Boardman is enormous when compared to the effective integration of these waste streams to power the operations of existing forest-product facilities. Consequently, it is unlikely that mill waste could serve as a viable feedstock source for the Boardman proposal.

The size and scope of the Boardman proposal is unprecedented in the United States and due to the insufficient levels of logging residue and mill waste generated by Oregon's timber industry, PGE will need to find alternative forms of feedstock.

2. Restoration Thinnings

To solve this feedstock problem, PGE has proposed sourcing the majority of the feedstock it will need from standing trees on public land.[x] According to Bruce Daucsavage, the president of Ochoco Lumber Company, if the Boardman proposal works out, "We can take more material out of the woods,"[xi] which raises concerns that ***energy needs might motivate increased forest harvest from public lands***. Ochoco Lumber is a partner in the public-private entity known as Oregon Torrefaction, which is responsible for helping provide feedstock for the Boardman proposal. Oregon Torrefaction's own website confirms Ochoco's plans by stating, "Oregon Torrefaction intends to source most of the biomass needs from forest restoration treatments."[xii]

The average amount of residue generated from thinning projects on public land each year is complicated to assess because each assessment must consider the specific needs for the treatment and the particular details of the site. For this reason, most assessments estimate the amount of material available based on the dollar value associated with each ton of residue produced. In other words, if the market places a higher value on these thinnings, more wood could be extracted from the forest.

In the past few decades, thinning restoration projects have become a source of political contention. Since European settlement, poor land management practices have suppressed wildfires in western forests beyond healthy balances, which means when fires do break out they are more severe and volatile. Many assume that the solution to this problem is to more aggressively thin forests; however, these projects face serious funding problems which has caused advocates for more aggressive thinning to urge forest management to be tied to the demand for biomass feedstock. Biomass advocates argue that the thinning-biomass approach alleviates economic limitations for more aggressive restoration while simultaneously providing fuel for the biomass industry.

While this may seem like a win-win scenario, managing our forests to meet energy needs may pose dangerous implications for Oregon's public forests. The argument to tie forest management to energy production is founded on the assumption that fires in the west are increasing and therefore thinning must increase to mitigate risk of fire; however, a recent report by the Geos Institute finds that wildfires are not increasing compared to historical periods. The report also highlights that ***thinned areas and fire outbreaks are unlikely to overlap***, stating that "Because fires in any single location are extremely rare, the chance of thinned areas, even over large landscapes, encountering fire within the timeframe that thinning is most effective is very low."[xiii]

Ultimately, forest management must be conducted to enhance ecological values and restore forest health, not to provide fuel for the energy sector. In drier parts of the state, the objective is often to restore the land "within the range of natural variation" – which means reducing the stocking density of the forest through tree thinning and other removals. What actually constitutes the historical "range of natural variation," however, is widely contested. Aggressive restoration focused on the treatment of a particular stand with insufficient attention to broader forest health can have adverse cumulative ecological impacts at the forest biome level.

Forest management practices motivated to meet energy needs sets a dangerous precedent for our public forests, especially when continuous large volumes are needed in the supply chain as is the case with the Boardman proposal. In the American South, forests are regularly clearcut to produce wood pellets for

Britain's booming biomass industry, which demonstrates what can happen when forest management is motivated by energy needs.[xiv]

3. Arundo Donax

PGE is also considering an energy crop called *Arundo donax* (giant cane) as a possible source of fuel due to its rapid growth and high energy content. Arundo can grow 5-10 cm per day[xv] and each year the energy crop is estimated to yield between 20-33 tons per acre.[xvi] [xvii] If the Boardman facility were to only burn Arundo, PGE would need 1.2 million tons of torrefied Arundo, or about 2,173,600 dry tons of untorrefied Arundo on the front end.[xviii] Depending on the tons produced per acre, this amount of Arundo would require between 67,000 - 111,500 acres (for reference: 92,800 acres is the size of Portland city limits).

Unfortunately, the same characteristics that make Arundo such a high producing energy crop also make it a ***highly invasive plant***. Since its introduction to the North American continent in the 19th century, Arundo has taken over river banks in California, Texas, and elsewhere, causing major damage to ecosystems and watersheds.[xix] In a 2012 letter to the EPA, dozens of environmental groups from around the country spoke out against Arundo donax being treated as a viable energy solution. The letter stated, "Given the difficulty of eradicating Arundo donax and the extent of potential environmental damages, it is highly unlikely that the benefits would clearly outweigh the costs."[xx] The Native Plant Society of Oregon echoed these concerns when they expressed caution over PGE's plans, saying "No regulations can be strong enough to prevent this plant from escaping cultivation when it is planted on a large scale for biofuel production."[xxi]

II. TRANSPORTATION

Transporting 3.5 - 4 million green tons of wood, energy crops, and other biomass feedstock to rural Northern Oregon will be a major logistical feat. For the test burn alone, about one third of the torrefied material needed will be transported across the country from a plant in Mississippi (see Figure 2). Transportation logistics are complicated by the fact that most of this material will be sourced from disparate locations such as logging sites and restoration treatments in Oregon's backwoods. Location is a fundamental component in determining the accessibility and economic viability of a biomass source, even when subsidies are considered. The further biomass must be transported, the higher the cost both financially[xxii] and environmentally.[xxiii] For example, increasing truck traffic on forest roads results in up to 4 times as much erosion as low traffic, erosion that negatively impacts Oregon's watersheds.[xxiv]

Figure 2

Sourcing from Mississippi

PGE plans to source roughly one third of the torrefied feedstock needed for this month's test burn (2,000 - 3,000 tons) from a torrefaction plant in Quitman, Mississippi. If 2,500 tons of material are transported by truck, roughly 250 trucks would have to drive a combined total of 575,000 miles.

Based on average fuel efficiency for trucks and EPA data on diesel carbon emissions/gallon, this trip across the country would emit about one thousand tons of CO_2. In other words, ***transporting just 1/3 of Boardman's feedstock for a single day will emit the same amount of CO_2 that 191 passenger cars emit on average each year.***

Once the wood and logging waste emerges from the forest roads, it would need to be transported to a torrefaction facility either in Grant County or the Port of Morrow. Once processed, 8,000 tons of torrefied material would then need to be trucked to the Boardman facility itself, ***requiring 800 trucks every day.***[xxv] Currently, coal supporting Boardman arrives by train, but since biomass would be trucked, local traffic will inevitably increase. Trucks increase traffic at a rate more than double than passenger cars[xxvi] and emit almost five times as much carbon as rail.[xxvii] Increased traffic has a negative impact on

property values[xxviii] and intensifies required road maintenance for local communities.[xxix] All told, the external costs of freight trucking (considering accidents, air pollution, greenhouse gasses, and noise) comes to .86 cents per ton-mile, versus .24 cents a mile for freight trains.[xxx]

III. TORREFACTION

Torrefaction is a process in which biomass is roasted at 200-350°C in an airless environment, removing moisture and breaking down volatile substances.[xxxi] This treatment technique improves the energy density of biomass and makes it easier to store; however, torrefaction is energy intensive and may result in the loss of up to half of the original mass of the feedstock. According to PGE, wood has a mass retention rate of about 65% during the torrefaction process[xxxii] and it is estimated that Arundo donax has a 56% mass retention rate.[xxxiii]

The vast majority of biomass facilities in the world do not burn torrefied material, making the PGE proposal both unique and unprecedented. PGE is part of a public-private partnership known as Oregon Torrefaction, which is intended to supply torrefied biomass for the Boardman power plant. Currently, the partnership is operating two pilot torrefaction sites at the Port of Morrow and the partnership has plans to build a large torrefaction facility in Grant County.[xxxiv] If the Boardman project goes forward, these plants would need to process 1.9 million tons of dry biomass a year to supply 8,000 tons of torrefied material each day.

IV. COMBUSTION

1. Carbon Consequences

The low energy density of biomass makes it an exceptionally inefficient fuel, which means it emits more CO_2 per unit of energy produced when compared to fossil fuels. In fact, ***an average biomass facility emits 40-60% more CO_2 than an average coal plant*** and almost 300% more CO_2 than a new natural gas plant, simply because so much more material is burned to generate the same amount of power (see Figure 3).[xxxv]

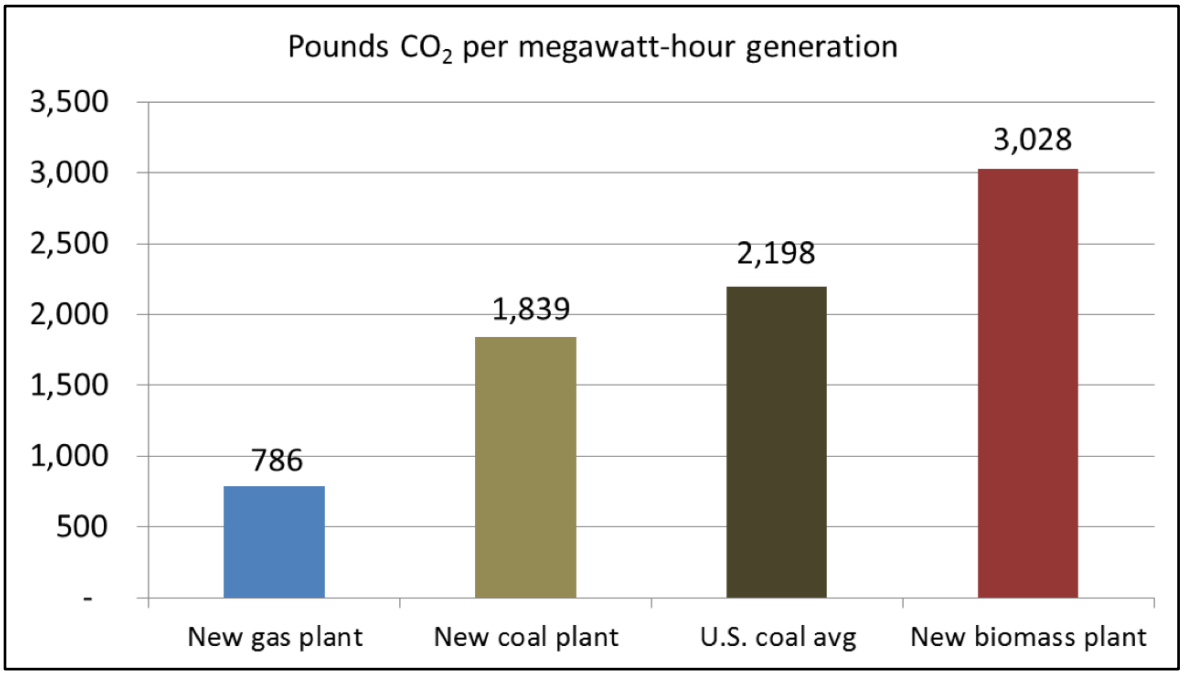


Figure 3 - Typical CO_2 emission rates from power plants burning fossil fuels and biomass.

Advocates of a growing biomass industry often claim that despite these high smokestack emissions biomass energy production is "carbon-neutral." They argue that when biomass is removed from the forest and combusted for energy, the large amounts of carbon spewed into the atmosphere are eventually re-captured, or "sequestered," by the forest's regrowth; however, these proponents neglect to recognize the timeline: ***a forest takes many decades to regrow whereas biomass power plants emit tremendous amounts of carbon instantaneously***. The moment these biogenic carbon molecules are emitted into the atmosphere they begin to actively trap heat, thus warming our planet. In the atmosphere there is no distinction between carbon molecules derived from biomass or fossil fuels – both kinds prevent energy from escaping to space. A sudden increase in biomass energy would spell a dramatic spike in carbon emissions at a time when we need to reduce carbon levels as soon as possible.

To be sure, PGE's proposal to substitute biomass for coal in their Boardman plant won't necessarily result in 40-60% more carbon emissions because they plan to burn torrefied biomass instead of wood pellets. While torrefied biomass has a higher energy density and emits less carbon at the smokestack, a great deal of energy is needed during the torrefaction process itself, energy that is mostly generated at conventional power plants that burn fossil fuels. In addition, the torrefaction conversion process emits much of the carbon stored in the feedstock, however, the exact amount of carbon emitted during this process varies depending on the type of feedstock being treated.[xxxvi] [xxxvii] Since there is little definitive research on a torrefaction operation of this size, the true carbon consequences are unknown. When the carbon emissions and the amount of energy used are factored in, many of the climate benefits often associated with torrefaction may be negated.

From a climate standpoint, biomass is concerning not only because of the smokestack and torrefaction emissions, but also because providing feedstock requires the removal of standing trees, which diminishes the forest's capacity to mitigate climate change by capturing and safely storing carbon. Excessive thinning projects and the removal of whole trees to fulfill the demand for fuel would be entirely unacceptable, especially as we continue to depend on our forests as carbon sinks. In fact, the country's ability to reach emission reduction goals under the Paris Accord will depend on our forests' ability to sequester the same, if not more, carbon than they have in the past.[xxxviii]

2. Carbon Neutrality Loophole

Despite the proven carbon consequences of biomass energy production, industry interests are making a concerted effort to pass legislation in Congress that classifies biomass as "carbon-neutral" nationwide. This classification is concerning for two main reasons, the first of which is that Congress is crafting climate policy with complete disregard to scientific fact, setting a dangerous precedent for how our government responds to the impending climate crisis. While there are climate benefits associated with some forms of biomass energy production (i.e. small-scale generation in mills), these benefits do not universally apply to all scenarios and therefore ***any blanket designation of carbon neutrality is inaccurate***. The EPA acknowledges that accounting for the carbon emitted during the combustion of biomass is an inherently complicated process, and therefore "it is a conclusion that should be reached only after considering a particular feedstock's production and consumption cycle."[xxxix]

The second chief concern of the biomass loophole is that a classification of carbon-neutrality would rapidly grow the industry, posing serious implications for the climate, our forests, and public health. Government data predicts that a carbon-neutrality designation would almost double the size of the biomass industry in just a few years[xl] and that this growth will displace solar production, not coal.[xli] Many industry groups support the loophole because it would classify biomass as a renewable alongside wind and solar while simultaneously facilitating increased harvest from Oregon's forests. Not surprisingly,

PGE supports the carbon neutrality loophole, which demonstrates their intent to confront the global climate crisis, at least in part, by burning trees and energy crops.[xlii]

3. Air Pollution

Burning biomass also creates dangerous air pollution that can lead to an array of health problems. Biomass facilities emit large amounts of particulate matter (also known as "soot"), which can cause asthma attacks, cardiovascular disease, and even death in some cases. These facilities also threaten public health in adjacent communities by emitting nitrogen oxide, carbon monoxide, and various carcinogens. Earlier this fall, public health groups from around the country signed onto a letter urging Congress "to oppose policies that would encourage or expand the use of biomass for electricity production." Acknowledging the role that a changing climate has on human health, these organizations called for the development of truly clean and truly carbon-neutral forms of energy such as solar and wind energy.[xliii]

CONCLUSION

After considering how Boardman's biomass feedstock would be grown, harvested, transported, treated, and burned it can be concluded that the current proposal would have dangerous consequences for national forests, climate change, and public health. Due to insufficient levels of wood waste generated by Oregon's timber industry, PGE will have to rely on the cutting of whole trees from public lands to feed their old coal plant in Boardman. As PGE proceeds with this proposal, it is incumbent upon the utility to conduct a thorough analysis of their supply chain to ensure that the 3.8 million green tons of biomass needed each year is sustainably sourced, transported, and treated.

This inquiry also found that burning biomass at Boardman could likely exacerbate climate change by facilitating the release of CO_2 that would otherwise remain sequestered in the forest. In order to meaningfully respond to the current climate crisis, our government and utilities must respect the scientific process and take its findings seriously. This means acknowledging that large-scale biomass energy production poses major carbon consequences and therefore cannot be treated as a renewable resource alongside solar and wind. The closing of the Boardman coal plant gives Oregon a unique opportunity to replace coal with truly renewable forms of energy. Therefore, we urge PGE to work with community partners to quicken a full transition to truly renewable forms of energy in the coming decade. Just as oil, coal, and gas must be kept in the ground if we are to avoid catastrophic climate change, so too must trees be kept in the forest.

[i] Portland General Electric. "Integrated resource planning: preparing for Oregon's energy future." (2016): 205.

[ii] Calculations:

Wood

- est. 75% of feedstock = 912,000 torrefied tons/year
- 65% mass retention rate
- 1,403,000 dry tons

Arundo

- est. 25% of feedstock = 304,000 torrefied tons/year
- 56% mass retention rate
- 543,400 dry tons

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Figure 3

CO_2 emissions per MMBtu heat input:

a, b, c : from EIA at http://www.eia.gov/environment/emissions/co2_vol_mass.cfm. Value for coal is for "all types." Different types of coal emit slightly more or less.

d: Assumes HHV of 8,600 MMBtu/lb for bone dry wood (Biomass Energy Data Book v. 4; Oak Ridge National Laboratory, 2011) and that wood is 50% carbon.

Efficiency of power plants:

a: DOE National Energy Technology Laboratory: Natural Gas Combined Cycle Plant F-Class (http://www.netl.doe.gov/KMD/cds/disk50/NGCC%20Plant%20Case_FClass_051607.pdf)

b: International Energy Agency. Power Generation from Coal: Measuring and Reporting Efficiency Performance and CO 2 Emissions. https://www.iea.org/ciab/papers/power_generation_from_coal.pdf

c. EIA data show the averaged efficiency for the U.S. coal fleet in 2013 was 32.6% (http://www.eia.gov/electricity/annual/html/epa_08_01.html)

d: The Biomass Energy Data Book from Oak Ridge National Laboratory (http://cta.ornl.gov/bedb; page 83) states that actual efficiencies for biomass steam turbines are "in the low 20's"; PFPI's review of a number of air permits for recently proposed biopower plants reveals a common assumption of 24% efficiency.

a: DOE National Energy Technology Laboratory: Natural Gas Combined Cycle Plant F-Class (http://www.netl.doe.gov/KMD/cds/disk50/NGCC%20Plant%20Case_FClass_051607.pdf)

b: International Energy Agency. Power Generation from Coal: Measuring and Reporting Efficiency Performance and CO 2 Emissions. https://www.iea.org/ciab/papers/power_generation_from_coal.pdf

c. EIA data show the averaged efficiency for the U.S. coal fleet in 2013 was 32.6% (http://www.eia.gov/electricity/annual/html/epa_08_01.html)

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