From: Colin Fiske [redacted]
Sent: Monday, August 19, 2019 3:43 PM
To: Richard Engel <REngel@redwoodenergy.org>
Cc: Matthew Marshall <MMarshall@redwoodenergy.org>
Subject: Re: CAPE Comments

Just following up on this email thread. I'd like to make sure that my comments make their way into the ongoing (?) official "public comment" record for this preliminary draft, if they haven't already.

Also, to follow up on Richard's last email: You're right that we might not technically get all the way to 100% because of opt-outs, etc. - but that's certainly the vision!

And one final comment: I'd like to see something in the CAPE about the importance of assessing sources of electricity/energy for their short, medium, and long-term climate impacts, and applying a strict no-climate-impact policy as a criterion for the "100% clean and renewable" goal.

From: Colin Fiske [redacted]
Sent: Thursday, July 11, 2019 3:35 PM
To: Matthew Marshall
Cc: Richard Engel
Subject: Re: CAPE Comments

Thanks for the context on that suggestion. I like the elegance of it, but I still feel serious reservations about the idea of putting RCEA in a position to become (intentionally or not) reliant on natural gas revenues. It seems more like the structure of a "sin tax" (like a surcharge on cigarettes, for example), which you hope will reduce usage, but isn't really an effective tool for eliminating it altogether.

From: Colin Fiske [redacted]
Sent: Wednesday, July 10, 2019 5:38 PM
To: Matthew Marshall <MMarshall@redwoodenergy.org>; Richard Engel <REngel@redwoodenergy.org>
Subject: CAPE Comments

Hi Matthew & Richard,

Here are a few comments I had on the preliminary draft CAPE update, that I thought I'd pass along now:

1. The Vision Statement is pretty good and mostly still applicable, I think. But the idea of having "most of our energy" come from renewables by 2030 needs to change to match the new 2025 100% goal.
2. Currently, there's a specific procurement target set for biomass, and no other type of energy. I realize the reason for this at this stage of the planning, but in the end I think there need to either be targets for the entire mix, or no specific targets at all.
3. I personally don't think that "promote advanced fuels," "develop biofuels," and "pursue biogas development" should be goals in and of themselves. I think RCEA should stick to promoting transportation and heating electrification (rather than alternative combustion fuels for these processes) at this point, unless and until something else comes along that is actually proven feasible and environmentally superior. But if these alternative fuel items are going to be listed as goals anyway, they should be qualified by some definitions that acknowledge the need for net-zero or net-negative GHGs on a complete life-cycle basis.
4. I'm adamantly opposed to RCEA considering becoming a "core transport agent" for natural gas. We should be focusing all of our efforts on getting off fossil fuels, not becoming middle-men in the fossil fuel business.
5. In the transportation section, it would be nice to have some statement recognizing that reducing VMT is the most important strategy for GHG reduction, and maybe something about working with member/partner agencies to support planning and programs to make it happen.
6. What does "Behavioral, Commissioning, and Operations (BROs)" (p.10) mean? I couldn't make any sense of this.
7. For practical purposes, I'd add a number scheme for strategies/goals/objectives – it's really hard to follow without one.

Thanks!

Colin

Siskiyou Land Conservancy

August 28, 2019

To:
Redwood Coast Energy Authority

Regarding:
Comprehensive Action Plan for Energy (CAPE) Public Workshop #1 Agenda
August 29, 2019 5:30-7:30
Humboldt Bay Aquatics Center, 921 Waterfront Dr, Eureka, CA Eureka

Dear RCEA,

Our CAPE should focus primarily on implementing resilient energy production in the County, and rely on offshore wind for energy exports.

Resilient energy requires dynamic independence from a grid vulnerable to shutdowns and wildfires.

Dynamic independence requires widespread distributed public and private local rooftop and open space PVs networked into smart minigrids coupled with electric vehicle (EV) capacity.

Since transportation emits 30-60% of our GHGs, and electricity generation another 30%, a distributed solar "internet" is the only and best way to reduce our carbon footprint, address our climate emergency, and share our energy wealth.

EVs are quiet, clean, long-lasting, require little maintenance, and when fueled from one's roof, enable payback for entire systems in as little as 4 years.

Municipalities exceed zero net energy when using solar charged EVs in their fleets, generating positive revenues immediately due to elimination of fuel and maintenance costs. EVs can supply mobile electrical storage and supply at night, in grid shutdowns, and to transport mobile electricity during emergencies to hospitals, shelters, food suppliers, etc.

Some worry that we cannot afford to solarize the county as a priority but instead must rely on fossil fuel powerhouses to fund utility scale power generation, when actually the opposite is true. We cannot afford *not* to. The technological and financial resources to do so are available, as are successful examples the world over, which we could emulate given the political will.

Currently, RCEA is committed to onshore wind as its priority to become “net energy exporters.”

This is a bankrupt strategy. The adverse impacts from onshore wind, including substantial GHG emissions during installation, consequences to biodiversity, lack of local ownership, and social divisiveness, render onshore wind anathema to a sound local energy policy. Onshore wind feeds the grid but does nothing for resiliency or electrifying transportation, since we still have to buy increasingly expensive electricity.

Accounting comparisons between onshore wind and solar ignore all the economic benefits that accrue to solar, such as increased equity as systems are repaid through energy savings, ownership of power, free fuel, revenue generation, little maintenance, many jobs, and preserving precious habitat and biodiversity. Distributed energy production shares our energy wealth democratically, rather than concentrating it in the hands of a few, like TerraGen. It’s only when utility scale wind is compared to utility scale natural gas, or coal, that wind looks good.

Clean windpower is available from the grid, just as we buy hydro from Shasta and solar from Fresno. In many places older turbines at established wind facility sites, where the impacts, wind patterns and infrastructure are all well-established, are being replaced with modern turbines at ratios of 300-400:20, thereby reducing impacts at those sites and feeding fossil-free electricity to the grid.

<u>In summary:</u>
1. Eliminate local onshore wind from the RCEA agenda, specifically HumWind.
2. Focus on recruiting some of the many financial and technological resources available to make possible widespread distributed solar and mini-wind/hydro, EVs, and storage accessible and affordable for individuals, neighborhoods, communities, businesses, and municipalities.
3. Electrify our heating, cooking and transportation.
4. Reduce and eliminate natural gas use.
5. Continue offshore wind exploration, including hydrogen production for fuel cells.
6. Continue all other RCEA conservation and feed-in tariff initiatives.

Respectfully submitted,

/s/ Ken Miller, Director
Siskiyou Land Conservancy

From:	Walter Paniak
To:	Lori Taketa
Subject:	Cape comment
Date:	Wednesday, September 11, 2019 1:42:39 PM
Attachments:	My turn Biomass electricity isnt cheap wont end wildfires CALmatters.pdf

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The attachment below was from CalMatters authored Michael Picker. This was published in August of 2018 when Michael Picker was the president of the California Public Utilities Commission.
Please attach it as a Cape comment.
--
Walt Paniak

California's forests are overgrown, in need of timber cutting. Image by aetb via Thinstock

My turn: Biomass electricity isn't cheap, won't end wildfires

Guest Commentary | Aug. 23, 2018 | COMMENTARY, ECONOMY, ENVIRONMENT, MY TURN

GUEST COMMENTARY: Find out more about submitting a commentary.

By Michael Picker, *Special to CALmatters*

With California's commitment to renewable energy and the growing concern about wildfires, biomass electrical generation is increasingly being promoted at the state Capitol as a tool for addressing both challenges as the legislative session is about to end. For a number of reasons, this approach has a lot to overcome.

A clean-energy policy has a different set of concerns than the issue of safety from wildfires. For clean energy, policymakers focus on emissions, price, and the ability of new resources to work together in ways that keep the lights on.

Fire safety revolves around reducing fuel, hardening communities to withstand ferocious fires and clearing vegetation from near electric lines. While these policies are not contradictory, there are obstacles to making them work in harmony.

There are 26 biomass plants in California that can generate enough electricity to power about 400,000 homes. These facilities rely on fuel sources ranging from agricultural waste to wood waste from lumber mills. Most of the plants are located near the fuel sources to reduce trucking costs. Many plants are not well suited to use fuel from high-risk fire areas since it is difficult to deliver sufficient fuel without incurring prohibitive costs, even if electric customers pay a premium for the energy.

After Gov. Jerry Brown's 2015 "Tree Mortality Emergency" proclamation, California utilities entered into a number of biomass contracts. These were focused on forest waste that was sold at premium prices to account for the cost of obtaining the forest fuel and could generate enough electricity for more than 100,000 homes. But even with prices two to four times higher than solar or wind power, most of the facilities will struggle to obtain enough fuel.

Increased use of biomass faces other obstacles, too. New power plants far from customers would require new transmission lines. Small power lines that served remote areas in the Sierra forests don't have the size and equipment to bring enough power to meet electrical needs hundreds of miles away. Building new power lines or upgrading existing ones to these biomass plants can cost millions of dollars.

Historically, biomass plants that burned forest waste were either owned by lumber mills or had entered into partnerships with them, but the California timber industry has shrunk. Now, public agencies such as the U.S. Forest Service are the major supplier of wood But with limited budgets to log and remove dead trees, not much progress has been made in reducing fire fuel.

The governor's interagency Forest Management Task Force is coordinating a study to identify and assess barriers to wider use of fuels from high-risk areas. But the current level of forest activities probably isn't enough to supply biomass facilities with an economically viable flow of fuel from high-hazard areas and is insufficient to meet forest management needs within those same fire-prone regions.

Building a new sustainable forestry industry in the Sierra and Siskiyou mountains could make biomass facilities more effective as part of a whole array of fire prevention tools, as well as offering jobs and economic development in those communities.

But on its own, biomass is a limited fire prevention tool and will require extensive ratepayer subsidies. Even with subsidies, biomass may not work as an effective fire-prevention tool outside pine forests.

It seems clear that if we're counting on biomass electricity generators to significantly reduce the number and ferocity of fires, we'll fall short. If we expect these generators

to help with carbon reduction, we'll also fall short. And if we overbuild these plants to provide more electricity, we'll overshoot our demand for what customers need.

Simple solutions to complex issues often sound good at first but may look unwise in hindsight. If there is a role for biomass in mitigating against more destructive wildfires, it's only part of a much larger firefighting and sustainable forestry strategy.

Michael Picker is president of the California Public Utilities Commission, Michael.picker@cpuc.ca.gov. He wrote this commentary for CALmatters.

Commentaries

CALmatters welcomes commentary pieces focused on California policy and politics. Below are our guidelines:

- We will edit them, post them on our site and share them with our news partners. They may publish them.
- Your op-eds must be exclusive to CALmatters and no more than 650 words.
- Please include your photo and email address for publication.
- Please also include phone number so we can reach you.
- If your piece is selected for publication, we will ask that you sign a release, and statement that you have read and accept our ethics policy.

Please contact Dan Morain with any questions, dmorain@calmatters.org, (916) 201.6281.

READER REACTIONS

- **BIOMASS ENERGY**, *by Bill Walzer, Berkeley on Aug. 26, 2018*

Want to submit a reader reaction? You can find our submission guidelines here. Please contact Dan Morain with any questions, reactions@calmatters.org, (916) 201.6281.

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COMMENTARY

From: Walt Paniak
To: Lori Taketa
Subject: Cape comment for Forestry discussion
Date: Wednesday, September 11, 2019 2:45:22 PM
Attachments: Climate-Impacts-of-Industrial-Forest-Practices-in-NC-web.pdf

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Please submit this as Cape comment. These same parameters can be applied to our forests with the timing a little modified however the GHG component is the short run (one year to several decades) are consistent.

Walt






CLIMATE IMPACTS OF INDUSTRIAL FOREST PRACTICES IN NORTH CAROLINA

Synthesis of best available science and implications for forest carbon policy

PART I—SEPTEMBER 2019

DOGWOOD ALLIANCE

CENTER FOR SUSTAINABLE ECONOMY
Building the DNA of the New Economy

PREPARED FOR DOGWOOD ALLIANCE BY

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With research support from
Sam Davis, Ph.D. and Liana Olson

CONTENTS

Industrial logging and wood product manufacturing emit enormous quantities of greenhouse gases.

A wetland forest clearcut near Woodland, NC to feed a nearby Enviva wood pellet facility.

SUMMARY AND KEY FINDINGS

Each year, roughly 201,000 acres of forestland in North Carolina are clearcut to feed global markets for wood pellets, lumber, and other industrial forest products.

Roughly 2.5 billion board feet of softwood and hardwood sawtimber are extracted annually, an amount equivalent to over 500,000 log truckloads.[1] The climate impacts of this intensive activity are often ignored in climate policy discussions because of flawed greenhouse gas accounting and the misconception that the timber industry is carbon neutral.

The reality, however, is that industrial logging and wood product manufacturing emit enormous quantities of greenhouse gases and have significantly depleted the amount of carbon sequestered and stored on the land. In addition, industrial tree plantations pose a serious threat to North Carolina's climate change resiliency because they make the effects of floods, droughts, heat waves, storms, and disease more severe.

This two-part report synthesizes and analyzes the best available climate science on the impacts of industrial forest practices in North Carolina. It aims to serve as an evolving source of technical information and inform policies to encourage climate smart forest practices. As more and better data become available, they will be incorporated in subsequent versions.

Part 1 of the report discusses how industrial forest practices disrupt nature's carbon cycle and provides an overview of three key climate impacts—loss of carbon storage, increased emissions, and loss of carbon sequestration capacity. Several key findings emerge:

[1] See, e.g. Howard, J.L., Quevedo, E., Kramp, A., 2005. Use of Indexing to Update U.S. Annual Timber Harvest by State. Research Paper FPL-RP-653. Madison, WI: USDA Forest Service, Forest Products Laboratory; NC State Extension Service: North Carolina Lumber Production, Consumption, and Revenue Trends 1998 to 2016. Available online at: https://content.ces.ncsu.edu/north-carolina-lumber-production-consumption-and-revenue-trends.

- Industrial forest practices, including clearcutting, timber plantations, application of chemicals and fertilizers, and construction of dense networks of logging roads disrupt natural forest carbon cycles by reducing the buildup of carbon stored in vegetation and soils, reducing carbon sequestration capacity and generating major quantities of greenhouse gases.
- North Carolina's industrial forestlands store far less carbon than the native forests they have replaced. On intensively managed timberlands and tree plantations the amount stored has been reduced by roughly 50%.
- Afforestation, reforestation, and proforestation (letting forests grow to maturity) have the potential to sequester and store nearly 3 billion metric tons of carbon dioxide (CO_2). This is equivalent to 20 years of North Carolina's currently reported greenhouse gas emissions.
- CO_2 emissions from logging and wood products are a major missing component of North Carolina's greenhouse gas inventory. Emissions from the release of carbon in wood products, forgone sequestration capacity, decay of logging residuals, and fertilizer likely top 44 million metric tons of carbon dioxide each year, making this sector the third most carbon intensive in the state.
- Short rotation timber plantations for paper, pellets, and low-quality timber have created vast carbon sequestration dead zones encompassing 2.6 million acres. As a result, North Carolina's forestlands sequester far less carbon than their natural capacity would allow.
- Extending rotation periods would reduce the extent of carbon sequestration dead zones, produce more timber per acre, and could double the carbon sequestration rate of a given watershed.

Part 2 of the report will discuss the various ways industrial forest practices amplify the effects of climate change by making the landscape more susceptible to droughts, wildfire, floods, insects, disease, water pollution and the risks associated with harmful algae blooms. Part 2 will also review a list of climate smart forest practices that provide economically attractive alternatives to short rotation timber plantations for landowners and rural communities. Part 2 will also provide an overview of policy interventions the State of North Carolina can make to enroll forests in its overall climate agenda, properly account for logging and wood products emissions, and scale up these climate smart alternatives so that they become the norm and not the exception.

HOW INDUSTRIAL FOREST PRACTICES DISRUPT NATURE'S FOREST CARBON CYCLE

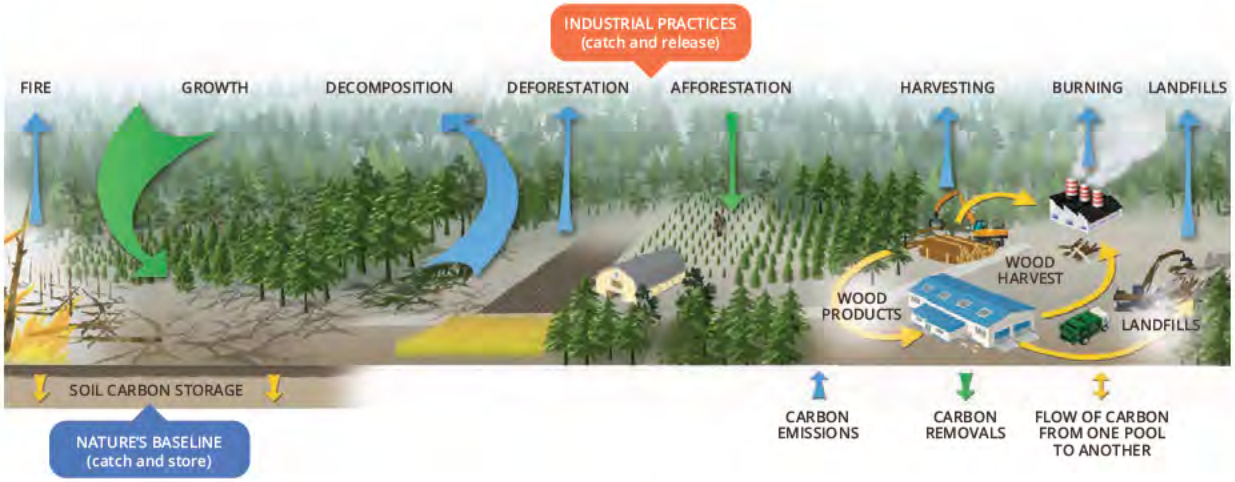
Industrial forest practices in North Carolina and other high timber output regions disrupt nature's forest carbon cycle and undermine the resiliency of the landscape to climate change. An illustration by Natural Resources Canada serves well as a stylized representation of these facts. Nature's forest carbon cycle—nature's baseline—is illustrated on the left-hand side of Figure 1. Natural forests sequester large amounts of carbon from the atmosphere (green arrow) and release small amounts from natural disturbances such as wildfires, storms, insects, and disease and more significant amounts from the natural decay of dead and downed wood on the forest floor. But the net amount of carbon sequestered is always positive and is so for many centuries.[2] Importantly, this allows the buildup of carbon stocks in forest soils. As such, we can think of nature's baseline as a forest carbon "catch and store" regime.

[2] In a comprehensive analysis of data from old growth forest plots across North America, Luyssaert et al. (2008) found that even in forests as old as 800 years "the net carbon balance of the forest and soils is usually positive—meaning they absorb more carbon dioxide than they release." See Luyssaert, S., Schulze, D.E., Knohl, A., Hessenmoller, D., Law, B.E., Ciais, P., Grace, J., 2008. Old growth forests as global carbon sinks. Nature 455, 213-215 (11 September 2008).

What role do forests play in the carbon cycle?

The "carbon cycle" is the movement of carbon from land and water through the atmosphere and all living things. Carbon in the atmosphere exists as CO_2, a greenhouse gas (GHG). Trees absorb carbon during photosynthesis and store it in their stems, branches and roots, removing large amounts of carbon from the atmosphere. A large proportion of this stored carbon also ends up in forest soil through natural processes such as annual leaf fall and tree death.

FIGURE 1



Trees release carbon back into the atmosphere during respiration, when they die and decay, and if they are burned in a forest fire. This dynamic process of absorbing and releasing carbon constantly affects Earth's carbon balance.

Forests are considered to be "carbon sinks" when they absorb more carbon than they release; and "carbon sources" when they release more carbon than they absorb. How humans manage forests and use wood also affects this balance.

In contrast, the industrial forest landscape can be thought of as a "catch and release" regime as illustrated on the right-hand side of Figure 1. Carbon is sequestered by plantations established on cropland (afforestation) or forestlands (reforestation). Most of that carbon is eventually released through timber harvest, wood products manufacturing, burning of woody biomass for energy, and decay in landfills. Clearcutting deforests the land, reduces net sequestration, and removes natural, climate resilient forests. Accumulation of carbon in the soil is eliminated or significantly reduced. As compared with nature's baseline, the industrial forest landscape stores less carbon, sequesters less carbon, emits more carbon into the atmosphere, and is more vulnerable to climate change.

Over the past decade or so, there have been significant advances in the ability to monitor changes in this forest carbon cycle through satellites, ground-based surveys, and modeling. This allows us to quantify impacts on various geographic scales, including states. In the sections that follow we summarize what the data show for North Carolina.

IMPACT 1

REDUCTION IN FOREST CARBON STORAGE ON THE LAND

The United States Department of Agriculture (USDA) Forest Service's Forest Inventory and Analysis Program (FIA) is a ubiquitous and widely used source of data on forest carbon stocks and flows for each state and ecological region within them. The FIA data can be extracted and analyzed with various tools. For our analysis, we relied on data extracted by the EVALIDator tool for North Carolina by Sam Davis, Ph.D., Dogwood Alliance's Conservation Scientist. Forest carbon stocks are expressed in tons of carbon per acre (tC/ac) and estimated for various ownership categories and ecological regions. In North Carolina, the data are organized by seven ownership categories and seven ecological regions.

What these data show is consistent with what is reported in the literature: because most North Carolina forestlands have been stripped of their original, old growth forests, the amount of carbon stored on the land is significantly reduced from nature's baseline.[3] Figure 2 illustrates the point by displaying forest carbon densities on various ownerships in the Central Appalachian Piedmont (CAP) ecoregion relative to "nature's baseline" carbon densities once present in old growth forests.

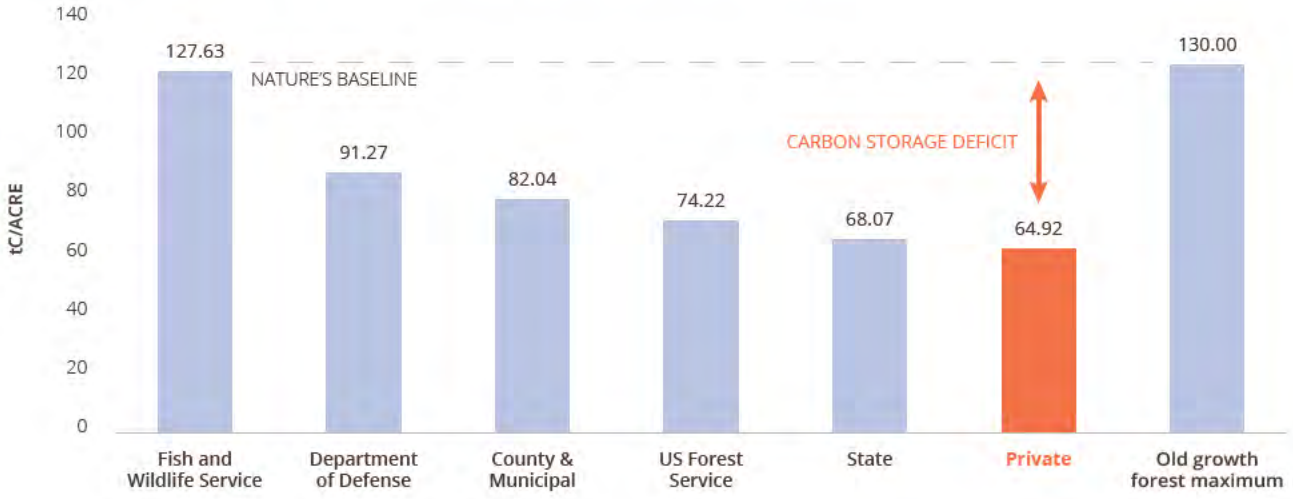
[3] For example, Brown (1999) found that "[a]lthough the total biomass density of eastern hardwood forests spans a wide range, their average biomass density is less than half of what it could be because they lack numerous large diameter trees as is typical for old-growth forests." Brown, S.L., Schroeder, P., Kern, J.S., 1999. Spatial distribution of biomass in forests of the eastern USA. *Forest Ecology and Management* 123: 81-90.

Establishing nature's baseline density is somewhat difficult because old growth forests now only exist in small remnants. Nonetheless, combining the few studies relevant to North Carolina's forest types with FIA data on maximum carbon densities found in the state suggest that a baseline figure of 130 tC/ac is a reasonable figure for the CAP ecoregion.[4] As shown in Figure 2, existing carbon densities range from quite near this maximum for National Wildlife Refuge (NWR) lands (i.e. Pee Dee and Roanoke Rapids NWRs) to less than 50% of nature's baseline on private lands where industrial forest practices are being implemented.

The resulting forest carbon deficit gives an indication of how much more carbon can potentially be captured and stored through climate smart forest practices. Climate smart practices simultaneously reduce emissions associated with logging, increase forest carbon storage on land, increase annual sequestration, and make the landscape more resilient to climate change.[5] Afforestation (reestablishing forests on land converted to agriculture a long time ago), proforestation (letting existing forests grow to maturity), reforestation (planting real forests not tree plantations), long rotations and thinning dense tree plantations to expedite their development into late successional and old growth forests are examples.

FIGURE 2

FIA CARBON DENSITY BY OWNERSHIP: CENTRAL APPALACHIAN PIEDMONT, NC



[4] Baseline estimates for hardwood ecosystems were taken from: McGarvey, J.C., Thompson, J.R., Epstein, H.E., Shugart, H.H. Jr., 2015. Carbon storage in old growth forests of the Mid-Atlantic: toward better understanding the eastern forest carbon sink. *Ecology* 96(2): 311-317. Baseline estimates for long leaf and loblolly pine were taken from: Bragg, D.C., 2012. Developing contemporary and historical live tree biomass estimates for old pine-hardwood stands of the Midsouth, USA. *Forest Ecology and Management* 281: 32-40.

[5] Talberth, J., 2017. Oregon Forest Carbon Policy: Scientific and technical brief to guide legislative intervention. Portland, OR: Center for Sustainable Economy. Available online at: https://sustainable-economy.org/wp-content/uploads/2017/12/Oregon-Forest-Carbon-Policy-Technical-Brief-1.pdf.

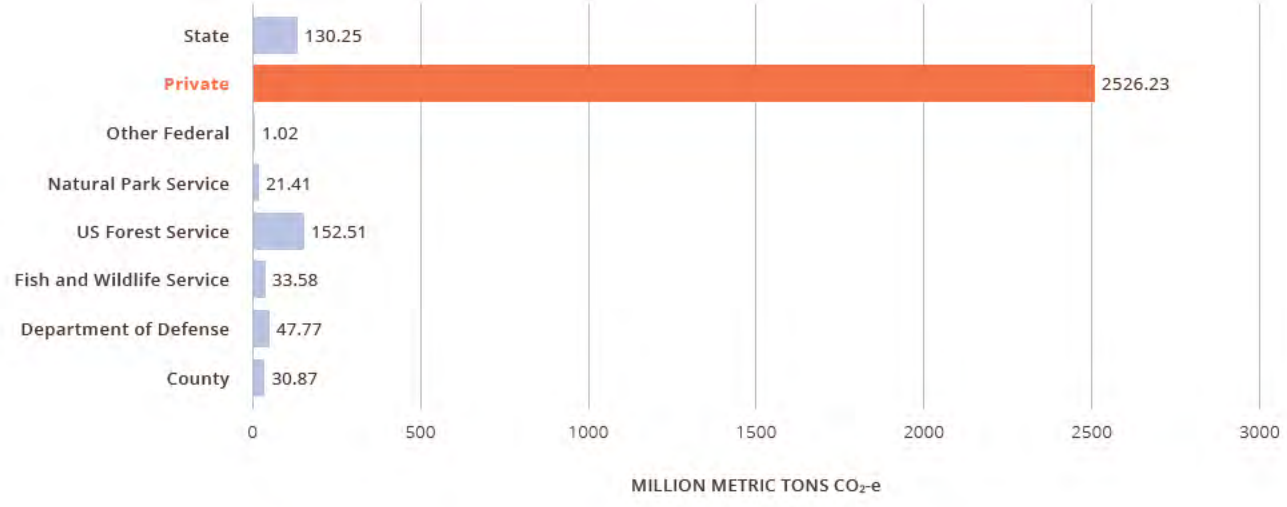
Within each ownership and ecoregion, we subtracted existing forest carbon densities from nature's baseline and then multiplied the difference by the number of acres in each ownership type. This allowed us to estimate how much more carbon could be stored on forestlands in North Carolina if these climate smart practices were implemented across the board. As shown in Figure 3, we estimate this amount to be nearly 3 gigatons of CO_2 (3 Gt CO_2-e)—equivalent to 20 years of North Carolina's currently reported greenhouse gas emissions.

The vast majority of the potential gain (2.5 Gt CO_2-e) is on private lands.

While it may be unreasonable to assume that climate smart practices could be implemented on every acre of private forestlands, this figure may still be a good target because it does not include the additional amounts that could be captured and stored through afforestation.

FIGURE 3

ADDITIONAL FOREST CARBON STORAGE POTENTIAL BY OWNERSHIP NORTH CAROLINA STATEWIDE




Paper, packaging and other short-lived products release most of their carbon in a decade.

IMPACT 2

GREENHOUSE GAS EMISSIONS FROM LOGGING AND WOOD PRODUCTS

Trees are half carbon by weight. As long as they stay in the forest, they continue to accumulate and store this carbon in leaves, needles, branches, trunks, and roots. When they die, some of the carbon is converted into CO_2 and emitted into the atmosphere, but most stays on site accumulating in the soil. As illustrated by Figure 1, industrial logging activities disrupt this natural carbon cycle and, as a result, most of the carbon that would have been stored in the forest and soils is released into the atmosphere.

Carbon is not stored very long in wood products, rather, it is converted to CO_2 and released in accordance with well-established timeframes that depend on the type of product produced. Burning woody biomass releases stored carbon immediately. Paper, packaging, and other short-lived products release most of their carbon in a decade. The half-life of carbon stored in longer lived wood products like structural lumber is generally fifty years or less, so most is gone at the end of the standard 100-year carbon accounting framework.

In addition to the release of CO_2 from wood products, forests that would otherwise have continued to accumulate carbon are clearcut. The land not only loses carbon sequestration capacity (this foregone sequestration capacity is considered an indirect emission under carbon accounting rules) but becomes a net source of CO_2 emissions due to the decay of logging slash left behind and disturbed soils. Finally, another tranche of emissions result from transportation of logs to the mills, manufacturing processes, and the use of pesticides, herbicides, and fertilizers associated with timber plantations. Given all this, it is not surprising that logging and manufacturing wood products are very carbon intensive activities.

In 2015 and again in 2017, the Center for Sustainable Economy (CSE) and its partners estimated the carbon emissions associated with industrial logging activities in western Oregon. Conservatively, we estimated emissions to be about 33 million metric tons CO_2 equivalent per year (33 MMT CO_2-e/yr), making this sector the most carbon intensive in the state.[6] A subsequent analysis by an Oregon State University team, using

[6] Talberth, 2017, Note 5.

a somewhat different methodology, also estimated this same level of emissions.[7] In the remainder of this section, we replicate the CSE methodology to produce preliminary estimates of the carbon emissions associated with logging and wood products in North Carolina.

For this analysis, we limited timber harvest emission calculations to those associated with harvesting (wood products decay minus the residual that continues to be stored after 100 years), foregone sequestration capacity, decay of logging residuals, and use of forest fertilizers. We excluded transportation and manufacturing emissions as they are already assigned to other sectors (i.e. transportation and industrial processes) in North Carolina's existing greenhouse gas (GHG) inventory. Emissions from soil disturbance, pesticides, and herbicides are also difficult to quantify at this time. So, for purposes of this analysis, preliminary logging and wood products emissions are calculated as follows:

LWP = (REM – STOR) + FS + DR + FER, where:

LWP = logging and wood products related emissions (MMT CO_2-e/yr)
REM = CO_2-e removed from site by timber harvest
STOR = CO_2-e removed from site and stored in long-lived (100+ years) wood products
FS = Foregone sequestration from recently clearcut lands
DR = Decay and combustion of logging residuals
FER = Emissions associated with forest fertilizers

Timber harvest removals (REM)

The amount of forest carbon stored on site and removed by timber harvesting or clearing land for agriculture or development is reliably measured by multiple forest carbon monitoring platforms. The most ubiquitous is the FIA database. According to the most recent FIA data for North Carolina extracted using the EVALIDator tool, REM has averaged 35.27 MMT CO_2-e per year between 2000 and 2018. Raw removals data from EVALIDator is given by weight—short tons, about 21 million per year—and so has to be converted into CO_2-e units.[8] The standard process involves three basic steps: (1) converting short tons to metric tons by multiplying the former by 0.9072; (2) taking half this amount as the carbon component, and (3) multiplying this value by 3.67 to convert carbon to carbon dioxide equivalent. Alabama's Forestry Commission provides an excellent resource for walking forestland owners through these conversions.[9]

The vast majority (96%) of removals were from private and corporate lands[10] and from three primary ecoregions—Central Appalachian Piedmont (33%), North Atlantic Coastal Flatwoods (23%), and Middle Atlantic Coastal Flatwoods (18%).

[7] Law, B.E., Hudiburg, T.W., Berner, L.T., Kent, J.J., Buotte, P.C., Harmon, M.E., 2018. Land use strategies to mitigate climate change in carbon dense temperate forests. PNAS April 3rd, 2018 115 (14): 3663-3668.

[8] For this analysis, we limited removals to trees over 1" dbh and ignored below ground removals since much of this is related to land clearing for development purposes.

[9] Alabama Forestry Commission. 2009. Guidelines to Measure Carbon Sequestration in Alabama Forests. Montgomery, AL: AFC. Available online at: www.forestry.alabama.gov/Pages/Management/Forms/Carbon_Baseline_Inventory_Procedures.pdf.

[10] In North Carolina, the FIA classifies ownership by certain types of corporations—including Timber Investment Management Organizations (TIMOs) and Real Estate Investment Trusts (REITs)—under a "N/A" category. We thus consider the N/A ownership category in our analysis to be private.

Carbon stored in long-lived wood products (STOR)

Forest carbon removed from site during timber harvest has one of two ultimate fates over a 100-year period:[11] (1) through biomass combustion and decay of waste or wood products, it ends up in the atmosphere, or (2) a portion of it survives intact in long-lived wood products like structural lumber or furniture or remains buried in landfills. STOR estimates the second. In a nationwide analysis, Ingerson (2009) estimated STOR to range from zero to 21% of REM depending upon assumptions about the disposition of harvested wood.[12] Forest Service data tables for the Southeast estimate that 30% (hardwoods) to 34% (softwoods) of the embodied carbon in sawlogs is retained after 100 years in longer-lived wood products and landfills, and 14% (softwoods) to 18% (hardwoods) of the embodied carbon in pulpwood is retained 100 years after harvest in short-lived wood products and landfills.[13]

A recent (2016) analysis by the USDA Southern Research Station estimated the product output from North Carolina forestlands to be distributed as such: softwood—pulp and bioenergy products (31%); softwood—sawlogs, veneer, and other industrial products (43%); hardwood—pulp and bioenergy (8%), hardwood—sawlogs, veneer, and other industrial products (18%).[14] Multiplying these percentages by REM (which distributes REM to each product category) and then by the 100-year residual factor for each product type yields a weighted average value for STOR of 26% of REM, or 9.13 MMT CO_2-e/yr, largely corroborating Ingerson (2009). What this suggests is that out of the 35 million metric tons of CO_2 taken out of North Carolina's forests each year by timber harvesting and land clearing, about 9 million metric tons can be expected to be stored long term (>100 years) with the rest emitted into the atmosphere in a relatively short period of time.

[11] The 100-year framework is standard for GHG accounting in the US and for forest carbon offset projects. Generally, offset projects need to ensure that storage is guaranteed for at least this long. See, e.g. Ecotrust: A Landowner's Guide to Carbon Offsets (http://archive.ecotrust.org/forests/fco_intro.html).

[12] Ingerson, A., 2009 Wood Products and Carbon Storage: Can Increased Production Help Solve the Climate Crisis? Washington, DC: The Wilderness Society.

[13] Smith, J.E., Heath, L.S., Skog, K.E., Birdsey, R.A., 2006. Methods for Calculating Forest Ecosystem and Harvested Carbon with Standard Estimates for Forest Types of the United States. Gen Tech. Rpt. NE-343. Morgantown, WV: USDA Forest Service, Northeastern Research Station.

[14] Gray, J.A., Bentley, J.W., Cooper, J.A., Wall, D.J., 2017. North Carolina's timber industry—timber product output and use, 2013. e-Science Update SRS—116. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 4 p.

Foregone sequestration from clearcut units (FS)

When timber is harvested from a site, sequestration is reduced or eliminated until a new stand is established. If all other factors are held constant, the atmosphere will experience an increase in CO_2 concentration merely because the carbon dioxide once removed from the atmosphere by forest carbon sequestration at the site of harvest no longer occurs. FS measures this indirect emission. Measuring FS is a standard technique for evaluating the carbon emissions of land conversion, including conversion of natural forests to short rotation biofuel crops. Consideration of foregone emissions and the loss of associated economic benefits are also consistent with federal guidelines for economic analysis, which require use of a "with and without" framework. In particular, for an analysis of a proposed federal action, including a federal logging project, the guidelines require consideration of the stream of sequestration benefits that would have occurred in its absence.

Research has demonstrated that in multiple North American forest regions where even-aged (clearcut) techniques prevail, sequestration capacity is eliminated for an extended period after harvest. That period varies, and in Southeastern forests, can be as little as 3 years and as many as 15. In particular, net ecosystem productivity (NEP)—sequestration by young seedlings and brush minus emissions from decay and combustion of logging residuals—is actually negative for 3 to 15 years after clearcutting, meaning that these lands are not only carbon sequestration dead zones but net emissions sources. In Oregon, Turner et al. (2004) found that this period was about 13 years across western Oregon, where plantation logging practices were most heavily concentrated. We adopt that 13-year placeholder here pending more detailed information from North Carolina. As such, for each acre clearcut, FS is simply the pre-harvest sequestration value multiplied by 13.

[15] Air Resources Board. 2014. Staff Report: Initial Statement of Reasons for Proposed Rulemaking. Appendix I, Detailed Analysis for Indirect Land Use Change. Sacramento, CA: California Environmental Protection Agency.

[16] Circular A-4 requires an analytical framework of with and without. Regulatory actions should be evaluated "by determining the net benefits of the proposed regulation with and without it." Circular A-4, Section E(3).

[17] Johnsen, K.H., Leyser, T.L, Butnor, J.R., Gonzalez-Benecke, C.A., Kaczmaret, D.J., Maier, C.A., McCarthy, H.R., Ge Sun, 2014. Productivity and Carbon Sequestration of Forests in the Southern United States, Chapter 8 in: Climate change adaption and mitigation management options: A guide for natural resource managers in Southern forest ecosystems CRC Press - Taylor and Francis (pp. 193–248) 56 p.

[16] Turner, D.P., Guzy, M., Lefsky, M.A., Ritts, W.D., Van Tuyl, S., Law, B.E., 2004. Monitoring forest carbon sequestration with remote sensing and carbon cycle monitoring. *Environmental Management* 33(4): 457–466.

North Carolinians rally for forest protections in Charlotte, NC.

There are multiple sources of information about pre-harvest sequestration rates in North Carolina, but the most accessible is the FIA data itself. The FIA data accessed via EVALIDator provides estimates of CO_2 accumulated by forests in each ecoregion via growth as well as what is lost through natural decay and disturbance processes. For each ecoregion, subtracting the latter from the former provides a good way to estimate the carbon sequestration rates actually achieved by unlogged stands and, thus, is a basis for estimating FS.

The FIA data suggest sequestration rates that range from a low of 2.88 tons CO_2-e per acre per year (2.88 tCO_2-e/ac/yr) for forests in the Blue Ridge Mountain ecoregion to a high of 4.87 tCO_2-e/ac/yr in the Mid Atlantic Coastal Flatwood ecoregion. A weighted average of these values based on ecoregion-specific REM figures (to ensure that the sequestration value is calibrated to where timber harvest activities are concentrated) yields a statewide figure of 4.49 tCO_2-e/ac/yr that can be used as a basis for estimating FS. Total FS associated with a typical clearcut unit in North Carolina is therefore 4.49 x 13 or, 58.37 tCO_2-e per acre.

The final step in calculating FS is to multiply the annual acres clearcut each year by 13 and then by this statewide weighted average sequestration rate. Satellite data can be used to estimate the amount of land clearcut each year. World Resources Institute's Global Forest Watch project (GFW) provides a convenient and easy to access tool to do this. It measures forest cover loss and gain annually and allows users to select the canopy closure thresholds particular to the forest type they are analyzing. GFW data suggest an annual average rate of clearcutting of 231,357 acres during the 2000–2018 time frame. However, some of this is due to clearing for agriculture and urban development as well as storms and other natural disturbances. The latest FIA report for North Carolina (2015) estimates this figure to be 201,700 per year for final timber harvests, and so we adopt this as a more conservative figure that nets out non-timber harvest related sources of forest cover loss.

[19] Global Forest Watch interactive map and analysis tools are available online at: www.globalforestwatch.org.

[20] Brown, M.J., Vogt, J.T., North Carolina's Forests, 2013. Knoxville, TN: USDA Forest Service, Southern Research Station, FIA Research Work Unit.

FIGURE 4
SEQUESTRATION DEAD ZONES 2018, EASTERN NORTH CAROLINA

Areas in orange were clearcut within the last 13 years and emit more carbon than they sequester.

Hansen, M.C. et al. (2013) High-resolution global maps of 21st-century forest cover change. Science 342, 850–853.

Multiplying this by the statewide weighted per acre forgone sequestration value implies an FS figure of at least 11.77 MMT CO_2-e/yr. This value is conservative because it does not account for loss of sequestration for any other type of harvest unit other than clearcutting, even though thinning or selective harvesting also reduces sequestration at a site, albeit in a less dramatic fashion. Either way, tracking and mapping the amount of land that has been cleared over the past 13 years or so provides a rough indication of the extent of carbon sequestration dead zones that can be illustrated with use of the GFW platform (Figure 4). If we assume that the FIA final harvest estimate (201,700 acres per year) is about right, then it suggests that the current extent of these carbon sequestration dead zones is over 2.6 million acres.

Decay and combustion of logging residuals (DR)

As noted above, recently clearcut lands are net emissions sources, not sinks, for an extended period after harvest, largely as a result of the decay of logging residuals—slash, stumps, wasted logs, and dead roots—as well as their combustion when burned. NEP data can be used to estimate these emissions. For this analysis, we compiled post-logging NEP data from a variety of sources in different North American settings. For example, in Oregon, Turner et al. (2004) estimated post-logging emissions (indicated by a negative NEP value) to average -2.1 tCO_2/ac/yr for a 13-year period in Western Oregon. Grant et al. (2007) modeled post-harvest NEP at three sites in British Columbia to average about -9.2 tCO_2/ac/yr, also over a 13-year period.[22] Summarizing post-harvest NEP measured in several Southern US sites, Johnsen et al. (2014) indicated values as low as -30 tCO_2/ac/yr in a few years after logging that quickly reverted to rather high levels of net sequestration (> 11 tCO_2/ac/yr) in fertilized pine plantations but with far less recovery for unfertilized stands.

[21] Turner et al., 2004, note 18.

[22] Grant, R.F., Black, T.A., Humphreys, E.R., Morgenstern, K., 2007. Changes in net ecosystem productivity with forest age following clearcutting of a coastal Douglas-fir forest: testing a mathematical model with eddy covariance measurements along a forest chronosequence. *Tree Physiology* 27: 115-131.

Since the Johnsen et al. (2014) data are most relevant for North Carolina, we used this general NEP scenario (significant emissions for a few years transitioning into rapid sequestration after eight years) as a basis for a post-harvest NEP placeholder for this analysis. This is a conservative approach since it assumes that all acres logged in a given year are replanted with fast growing, fertilized plantations that maximize their growth. Averaged over 13 years, the data suggest a value of about -2.5 tCO_2/ac/yr. Multiplying this by the current acreage of carbon sequestration dead zones (2.6 million acres) yields a value of 6.56 MMT CO_2-e as an estimate of emissions associated with the decay and combustion of logging residuals in North Carolina each year.

Emissions associated with forest fertilizers

Timber plantations throughout North Carolina are routinely sprayed with a variety of herbicides, pesticides, and fertilizers to maximize their growth. Each of these chemicals has a carbon footprint that can be calculated on a life cycle basis. Unfortunately, data about the volume and types of chemicals applied are not easily accessible. One exception is forest fertilizers, such as urea. Data published by North Carolina's Forest Service suggest that each year, about 128,000 acres are treated with nitrogen and phosphorous fertilizers with application rates at about 225 pounds per acre.[23]

The carbon footprint of these applications includes all of the energy and materials used to produce the fertilizers and apply them in the field in addition to the gases released by the fertilizers themselves. However, most of these data are not readily available. But one aspect of the carbon footprint that can be estimated is the effect on nitrous oxide (N_2O) emissions—through microbial processes fertilizers generate N_2O, a gas with a global warming potential 300 times stronger than CO_2. Recent estimates of this effect suggest that for every metric ton of fertilizer applied, between 1.75% and 5% of that weight is converted into N_2O emissions. As a placeholder value, we assumed a 3% emissions figure for this analysis.

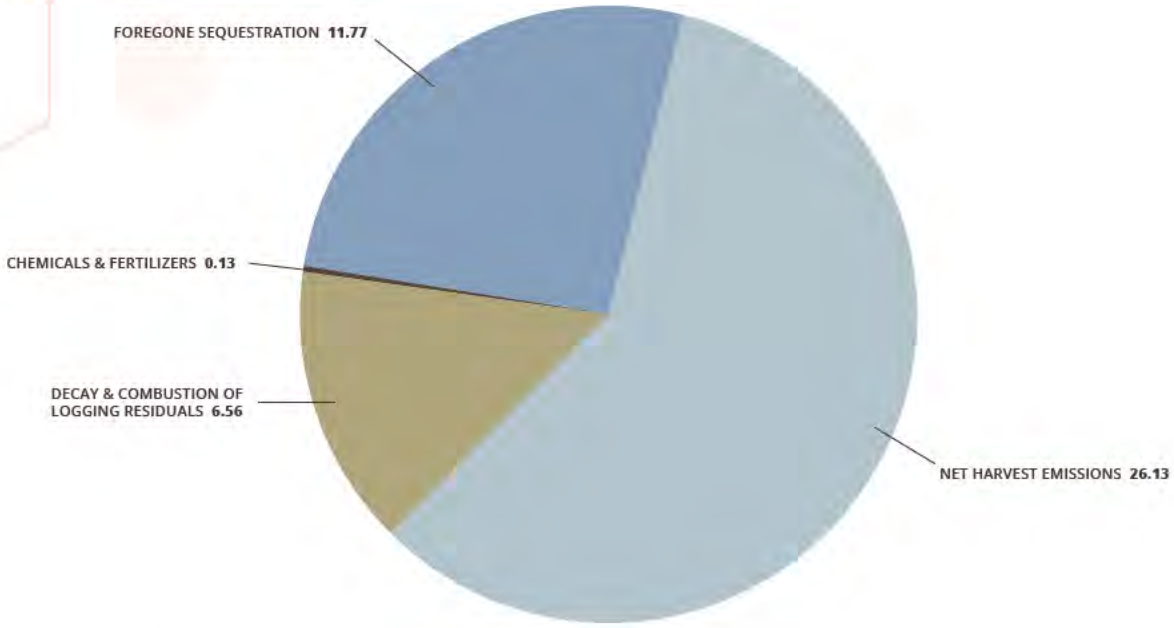
If approximately 225 pounds are applied per acre per year to an average of 128,000 acres, this implies an annual N_2O emission of about 444 metric tons per year. Multiplying this by 300 converts into 0.13 MMT CO_2-e/yr. While insignificant compared with other sources of logging related GHG emissions, the application of fertilizers to watersheds already overstressed from nutrient pollution has important implications for climate resiliency that will be discussed in Part 2 of this report. Also, it is important to note that this figure does not capture most of the life cycle emissions associated with production and application of fertilizers, nor does it include emissions associated with any of the other forest chemicals routinely used on North Carolina's forestlands. In subsequent updates of this analysis, we expect to include more of these data.

Total emissions related to timber harvest (ETH)

Combining emissions associated with timber harvest removals (REM), storage in long-lived wood products (STOR), foregone sequestration (FS), and decay and combustion of logging residuals (DR) suggest that emissions associated with logging and wood products in North Carolina averaged 44.59 MMT CO_2-e per year between 2000 and 2018 (Figure 5). This is a minimum figure since it includes an optimistic figure (26% for STOR) and only assigns forgone sequestration to a portion of the landscape affected by clearcutting. Putting this figure into perspective, it represents the third largest source of emissions statewide (Figure 6, Figure 7). This aligns well with national level findings. Across the U.S., and just counting REM minus STOR, timber harvest emissions are larger than emissions from the residential and commercial sectors combined.

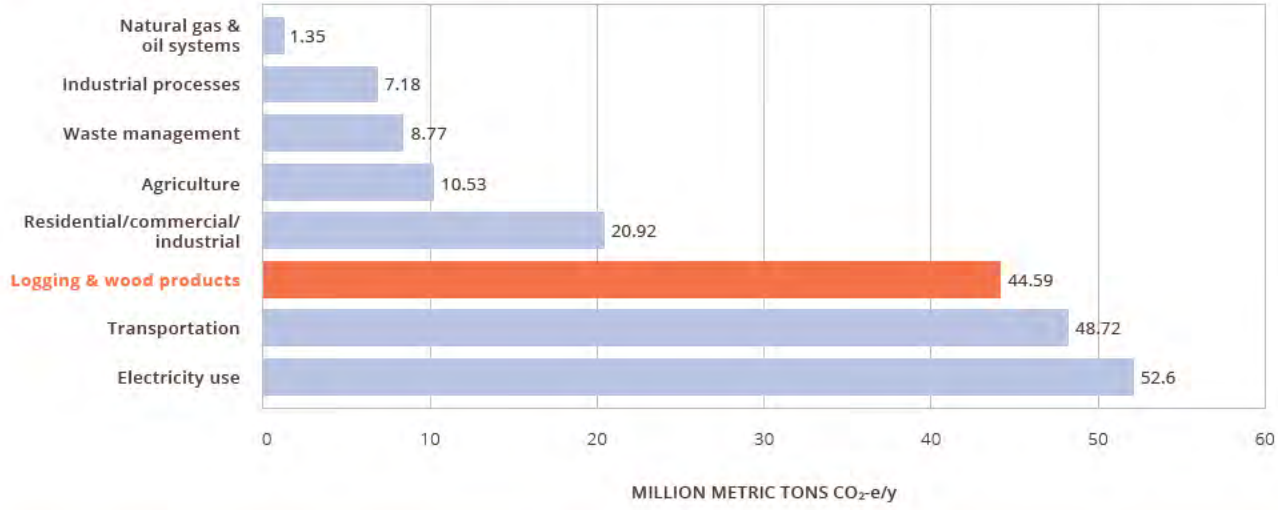
[23] Pickens, B., 2018. Silvicultural Research in the News. Summary of the Current State of Knowledge of Forest Fertilization in the Southeast. Raleigh, NC: North Carolina Forest Service; North Carolina State University Extension Service, 2011; Using Animal Manures in Forest Fertilization. Publication AG-738. Available online at: https://content.ces.ncsu.edu/using-animal-manures-in-forest-fertilization.

FIGURE 5
COMPOSITION OF LOGGING AND WOOD PRODUCTS EMISSIONS IN NORTH CAROLINA (ALL VALUES ARE IN MMT CO_2-E PER YEAR)



There are several ways to put this figure into perspective to help communicate the results to the public and decision makers. Since clearcutting is one of the most visible and concerning logging practices in North Carolina, it is useful to quantify the level of emissions associated with a typical clearcut unit. If we assume that all 201,797 acres of final harvest in North Carolina are clearcut units (a figure more or less in line with satellite-based estimates of forest cover loss), it means that logging and wood products related emissions amount to about 222 tons CO_2-e per acre logged. While clearcut unit sizes vary, a typical industrial scale unit is about 180 acres, which translates into about 40,000 metric tons CO_2-e.

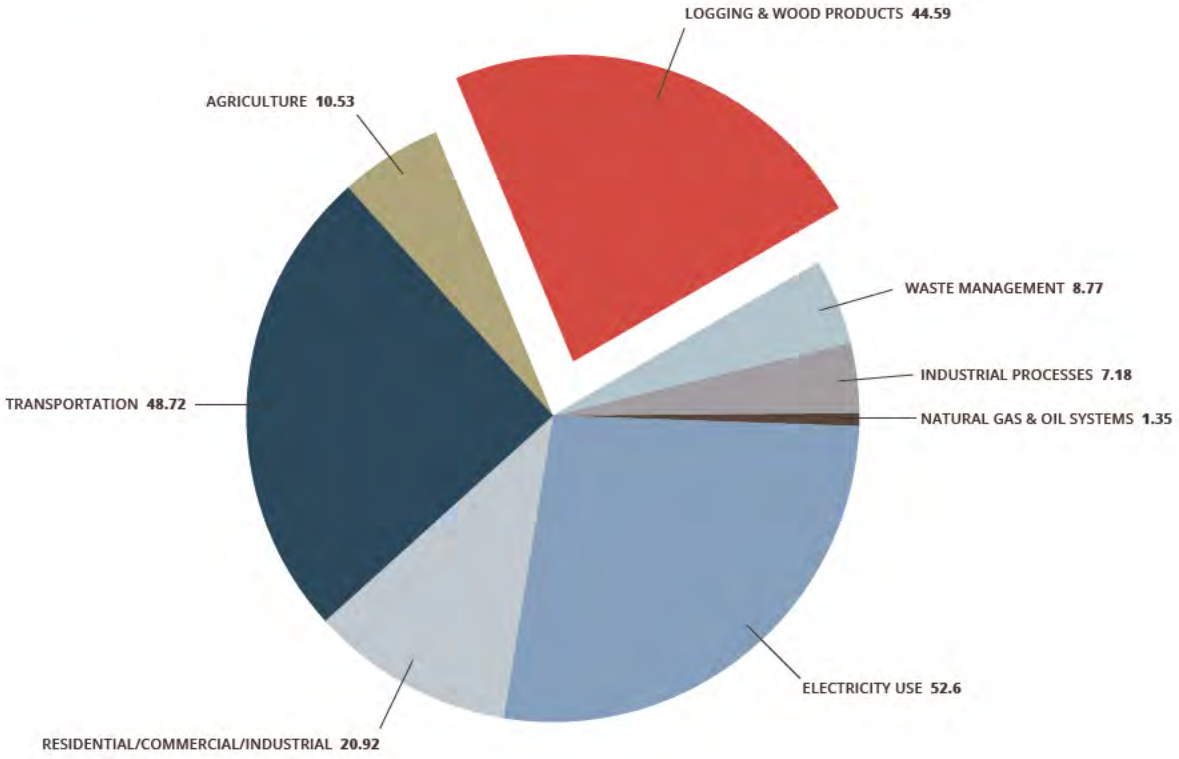
FIGURE 6
ADJUSTED GHG INVENTORY FOR NORTH CAROLINA: INCLUSION OF LOGGING AND WOOD PRODUCTS EMISSIONS (ALL VALUES ARE IN MMT CO_2-E PER YEAR)



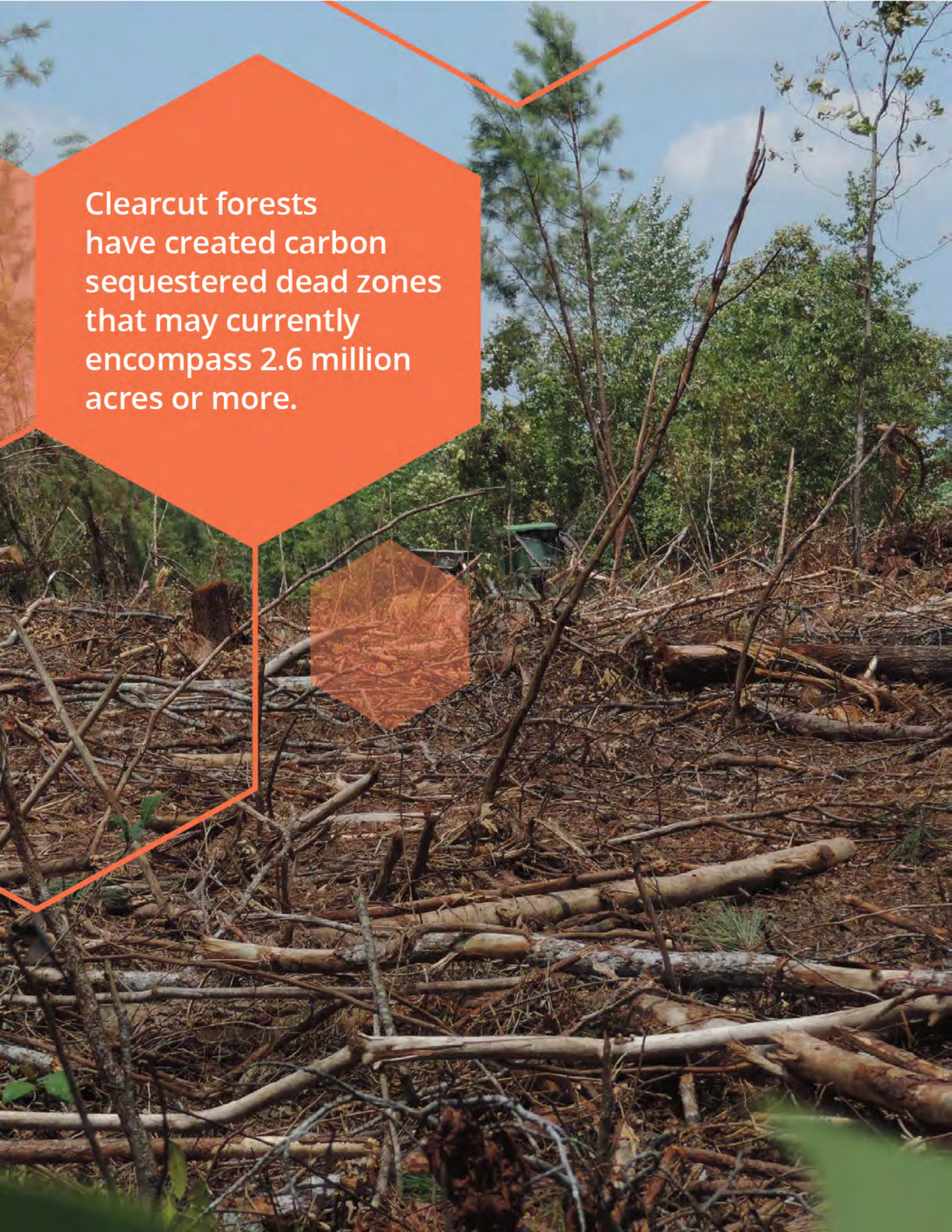
Clearcut logging along the Nottoway River, Northeastern NC.

FIGURE 7

ADJUSTED GHG INVENTORY FOR NORTH CAROLINA: INCLUSION OF LOGGING AND WOOD PRODUCTS EMISSIONS (ALL VALUES ARE IN MMT CO_2-E PER YEAR)



As noted previously, the weight of wood taken from North Carolina's forestlands over the 2000-2018 period averaged about 19 million metric tons. This translates into about 2.34 tons CO_2-e per metric ton removed. Lastly, North Carolina's timber harvest has averaged about 2.5 billion board feet per year. This translates into about 18 tons CO_2-e for every thousand board feet (mbf) harvested. These figures not only help visualize the emissions impact of logging and wood products but are useful in considering regulatory approaches for reducing these emissions, such as a carbon tax levy on each thousand board feet of logging. These options


Clearcut forests
have created carbon
sequestered dead zones
that may currently
encompass 2.6 million
acres or more.

IMPACT 3

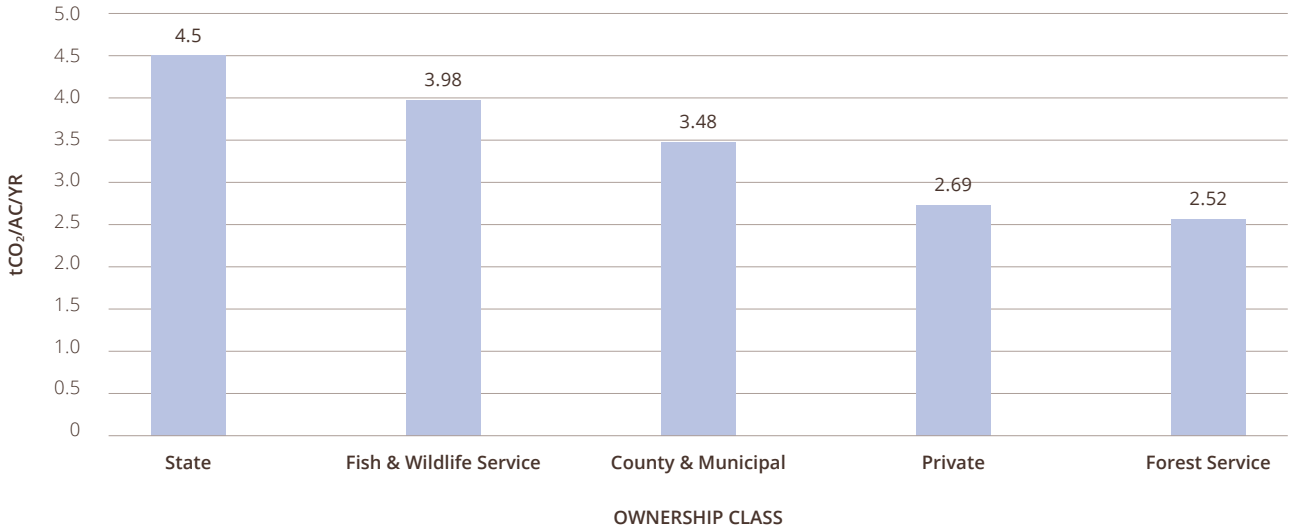
will be discussed in more detail in Part 2 of this report.

LOSS OF CARBON SEQUESTRATION CAPACITY

As discussed above, widespread clearcutting of North Carolina's forestlands has created vast carbon sequestration dead zones that may currently encompass 2.6 million acres or more. This is because each clearcut acre locks in a decade or more (13 years in our analysis) where that site is not functioning as a carbon sink but rather a source of emissions as residual stumps, roots, branches, leaves, and vegetation decays in the drastically altered microclimate left behind after logging. Such carbon sequestration dead zones were not part of nature's baseline conditions and so modern landscapes where industrial forest practices are being implemented are likely sequestering considerably less carbon than before. Some of the FIA data we extracted suggest this.

FIGURE 8

SEQUESTRATION RATES: CENTRAL APPALACHIAN PIEDMONT



For example, Figure 8 displays net carbon sequestration rates (growth minus mortality minus removals and decay of logging residuals) for the Central Appalachian Piedmont ecoregion. The highest sequestration rates are found on state, Fish and Wildlife Service, and County lands while private and Forest Service lands are sequestering the least. On Forest Service lands, it is likely that a high proportion of much older forests exist. While older forests store vastly more carbon than younger forests the annual rate of sequestration naturally declines and so the data may reflect this process. On private lands, however, the reasons are likely due to timber

harvest and associated carbon sequestration dead zones that occupy a significant share of the landscape. However, if reforested, these areas can start sequestering carbon again. Depending on the age of the trees that were cut, a landscape can have higher sequestration rates than the forests they have replaced. It all depends on rotation age—the number of years trees are allowed to grow between harvests. At short rotation ages more of the landscape is occupied by carbon sequestration dead zones, which more than offset any sequestration gains associated with managing for younger stands. With long rotations, the extent of dead zones is minimized but there are also fewer younger stands with higher sequestration rates. Table 1 illustrates this tradeoff with data taken from the previous sections.

TABLE 1

NET LANDSCAPE SCALE (10,000 ACRES) SEQUESTRATION BY ROTATION AGE

ROTATION AGE (YRS)	CLEARCUT ACRES/ YEAR	DEAD ZONE ACRES	DEAD ZONE %	DZ EMIT (TCO_2/YR)	RESID NEP (TCO_2/AC)	RESID SEQ (TCO_2/YR)	NET SEQ (TCO_2/YR)
20	500	6,500	65.00%	16,250	7	24,500	8,250
30	333	4,333	43.33%	10,833	6	34,000	23,167
40	250	3,250	32.50%	8,125	5	33,750	25,625
50	200	2,600	26.00%	6,500	5	37,000	30,500
60	167	2,167	21.67%	5,417	5	39,167	33,750
70	143	1,857	18.57%	4,643	4	32,571	27,929
80	125	1,625	16.25%	4,063	4	32,571	29,438
90	111	1,444	14.44%	3,611	4	34,222	30,611
100	100	1,300	13.00%	3,250	3	26,100	22,850
120	83	1,083	10.83%	2,708	3	26,750	24,042

The table presents estimates of net carbon sequestration in tons of CO_2-e per year attainable on a hypothetical North Carolina forested landscape of 10,000 acres with rotation age varying between 20 and 120 years in ten-year increments. For each rotation age, the table displays (1) the number of acres clearcut each year; (2) the resulting extent of carbon sequestration dead zones (assuming again the 13 year negative NEP duration on each acre clearcut); (3) the percent of the landscape occupied by these dead zones; (4) the emissions associated with these dead zones at a rate of 2.5 tons CO_2-e per year as discussed above; (5) an estimate of the sequestration rate (NEP) on residual forests outside dead zones; (6) the amount of CO_2 sequestered by these lands, and, lastly; (7) the net sequestration effect. Estimates of residual NEP were taken from various North Carolina and

nationwide studies, all of which depict a general trend of an initial spike in NEP at a young age, a relative rapid decline from that peak for a while, and then a slower decline at mid to old age.[26]

While the model presented in Table 1 is based on regional averages and is therefore no substitute for analysis of particular tracts with site specific data, the results clearly illustrate the drawbacks of managing the land on increasingly short rotation ages, as is happening in North Carolina. The movement to shorter and shorter rotation ages and more forestlands devoted to short-lived forest products like pellets and pulp results in a lower carbon sequestration capacity. With the assumptions embodied in Table 1, landscape-scale sequestration is maximized at a rotation age of 60 years with a secondary peak around 90 years. Short rotations below 30 years—which is becoming widespread in North Carolina—can be expected to capture about half of what can be achieved at longer rotations.

And while a focus on annual carbon sequestration is useful, the most important policy goal should not be maximizing landscape scale sequestration but rather forest carbon storage on the land.

It is this, ultimately, that will permanently reduce atmospheric CO_2 concentrations back toward the upper limit of 350 parts per million advocated for by the scientific community. Letting forests mature into old growth condition—despite lower sequestration rates—is the key to replenishing these forest carbon stocks. Longer rotation lengths can take us part of the way there, but, ultimately, as long as forests are managed with an eye towards logging (even if once every 90 years), captured carbon will eventually be re-emitted into the atmosphere.

[26] Johnsen et al., 2014, note 17.


The logging and wood products sector in North Carolina is the third most carbon intensive in the state.

CONCLUDING THOUGHTS

Industrial scale logging and wood products manufacturing in North Carolina are very carbon intensive, yet emissions from this sector are ignored in the state's GHG inventory.

Trees are half carbon by weight. When they are cut and converted into wood products, the vast majority of embodied carbon is released into the atmosphere as CO_2. For short-lived wood products like paper and pellets burned for energy, embodied CO_2 is released within a few short years after logging. For longer-lived wood products, the release is more gradual but nearly complete 100 years after logging due to the natural decay of wood products.

In addition, for ten to fifteen years after a forest is clearcut, the CO_2 released by the decay and burning of logging slash is greater than the CO_2 uptake by newly established trees and vegetation. As such, clearcut lands are not only carbon sequestration dead zones but net emissions sources for long after they are logged. Moreover, since these lands were previously sequestering rather than emitting CO_2, the atmosphere experiences a drop in the amount of CO_2 being taken out each year, which increases atmospheric CO_2 concentrations. This foregone sequestration effect is considered a form of indirect emission under standard GHG protocols but has never been incorporated into emissions inventories for the logging and wood products sector.

Additional logging and wood products related emissions come from the application of fertilizers, pesticides, and herbicides—all of which generate carbon emissions during their manufacture and use and, in the case of fertilizers, can react with the atmosphere or biological processes in the soil to generate nitrous oxide (N_2O), a gas with a warming potential 300 times more powerful than carbon dioxide. Other emissions are associated with the energy used in the manufacturing and transport of logs and wood products, but these emissions are already included in the state's GHG inventory.

This report compiled the best scientific and technical information available on sources of GHG emissions for the logging and wood products sector in North Carolina that are currently excluded from the state's GHG inventory. We estimate these additional annual emissions to exceed 44 million metric tons CO_2 equivalent each year, making this sector the third most carbon intensive in the state, not counting emissions associated with wood products manufacturing and transport. More research is needed to turn these preliminary estimates into a figure that can be folded into North Carolina's annual GHG inventory. As new and more precise information becomes available, this report will be modified to reflect it.

In this report, we have also documented how logging and industrial forest practices have significantly depleted forest carbon stocks and reduced the amount of CO_2 annually sequestered. Mirroring findings from other Eastern forests, we estimate that forest carbon stocks have been depleted by about 50% relative to nature's baseline—a baseline best measured by the carbon densities found in the few remaining tracts of old growth forest. The good news is that if these carbon stocks were replenished through climate smart practices, over 3 billion metric tons of CO_2 can likely be taken out of the atmosphere over the next fifty years—an amount equivalent to 20 years of North Carolina's currently reported GHG emissions. Such practices, like long rotations, will also help boost annual carbon sequestration capacity by greatly reducing the extent of carbon sequestration dead zones.

Policy interventions—such as forest carbon storage targets for industrial forestland owners—can help catalyze the transition to these climate smart alternatives. In Part 2 of this report, we will discuss carbon storage targets as well as other policy options available to decision makers in North Carolina to expedite this transition and help the state simultaneously reduce logging and wood products related emissions, boost forestland carbon storage, increase annual sequestration rates, and make the forested landscape more resilient to climate change.


FORESTS
=
COMMUNITY
DOGWOOD ALLIANCE

From: Ginni Hassrick [redacted]
Sent: Saturday, September 14, 2019 4:24 PM
To: Information <info@redwoodenergy.org>
Subject: Re: Comprehensive Action Plan for Energy update

Please consider other sources of wind generation? ie. Vortex, bladeless generators by Siemens....it is better for our wildlife, our noise and are simpler to transport. This company you are dealing with is really not impressive. We have choices. Wind....waves, solar. Think outside the bottom line promises of this horrible idea!
thank you.
Ginni Hassrick

From: Jerome Carman <jerome@eiaservices.net>
Sent: Sunday, September 15, 2019 1:02 PM
To: EnergyPlan2019@RedwoodEnergy.org
Subject: Comments on Draft CAPE Update

To Whom This May Concern,

Please find attached a pdf with comments embedded. These were also provided in hard copy at the August 29th workshop.

Thank you,
Jerome Carman

--
Jerome Carman
Owner, Principal Analyst | Environmental Indicator Accounting Services
PO Box 540, Arcata, CA 95518 | 707-273-3955 | jerome@eiaservices.net

Humboldt County

Comprehensive Action Plan for Energy

2019 UPDATE - PRELIMINARY DRAFT

6-21-19

REDWOOD COAST Energy Authority

Redwood Coast Energy Authority
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707-269-1700

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Website:
www.RedwoodEnergy.org

TABLE OF CONTENTS

Executive Summary

SECTION TO BE UPDATED

Consistent with Humboldt County's General Plan, the County of Humboldt recognizes the Redwood Coast Energy Authority (RCEA) as the regional energy authority to foster, coordinate, and facilitate countywide strategic energy planning, implementation, and education through a Comprehensive Action Plan for Energy (CAPE). This action plan consists of implementation measures specific to the functions of RCEA as the regional energy authority for Humboldt County and in alignment with the mission and purpose stated in RCEA's Joint Powers Agreement, which is to:

> Develop and implement sustainable energy initiatives that reduce energy demand, increase energy efficiency, and advance the use of clean, efficient and renewable resources available in the region.

The CAPE strategies target the following objectives:

> **Regional Energy Planning & Coordination:** Facilitate coordinated strategic energy planning within Humboldt County, provide a forum for addressing countywide energy issues, and assist local jurisdictions with completing greenhouse gas inventories, climate action plans, and general plan energy elements.
>
> **Energy Reliability & Security:** Coordinate with utility providers and other local governments on energy emergency planning and response, evaluate transmission and distribution systems, and conduct a climate change risk assessments and develop adaptation plans.
>
> **Economic Development:** Support the development of emerging energy technologies, attract and support energy-sector businesses and ventures, and provide training and workforce development assistance for jobs in the energy field.
>
> **Built Environment Efficiency:** Develop and implement programs which encourage energy efficiency and renewable energy retrofits in existing buildings, and support local implementation of state-wide energy efficiency standards and goals.
>
> **Education:** Through a variety of channels, provide the community with comprehensive education and information on energy conservation, energy planning, renewable energy, and energy-efficiency.
>
> **Water & Waste:** Support water and waste conservation initiatives that will result in reduce energy demand and or renewable energy generation.
>
> **Transportation:** Encourage energy-efficient, health-promoting modes of travel such as walking, bicycling, and public transit, and support the adoption of alternative fuels.
>
> **Energy Generation & Utility Services:** Promote policies which seek to meet local energy needs with a diversity of renewable energy resources, distributed generation, and cogeneration.

This action plan shall be periodically updated by the RCEA Board and presented to the Humboldt County Board of Supervisors for review.

Introduction

ENERGY FUELS OUR EVERYDAY LIVES

SECTION TO BE UPDATED

In Humboldt County, as in all parts of the United States, we depend on energy 24 hours a day, and we continuously benefit from direct and indirect use of energy resources. Energy is so pervasive in our daily lives that it can sometimes be taken for granted. From the sun we draw heat, light, and solar power; we depend on it to grow our food, forests, flowers, etc. We depend on fossil fuels to get us to work, school, the local shops, and the hospital; to transport our food, commodities, mail, and even garbage; we depend on it to visit exotic places by plane (and to get to the airport), or to visit a friend by car. Electricity enables us to work after the sun goes down; we depend on it to light our offices, classrooms, and streets; to keep our food cold and our ice cream frozen; to pump water through pipes; and to transmit information during this electronic age. Energy in a diversity of forms fuels our industries and business ventures: from powering lumber mills to dairy farms; from firing ceramics to pizzas, and from brewing beer to baking bread. Energy generation and transmission is also an industry in and of itself. Clearly, reliance on energy resources characterizes a large part of our everyday lives.

The production and consumption of energy also affects our daily lives in more indirect ways, particularly with regard to the environment. The burning of fossil fuels has led to damaging environmental effects such as acid rain, smog, water pollution, and global warming. Exploratory drilling and extraction of non-renewable energy sources (such as coal, petroleum, and natural gas), and their attendant infrastructure, has resulted in the degradation of other natural resources, for example forests, coastal communities, and rainforests. Although these areas may be far away, the environmental impacts can reach Humboldt County.

In Humboldt County, energy is used as a transportation fuel and as electrical and heat energy in homes, businesses, industries, and agriculture. In 2010 it is estimated that Humboldt County spent $460 million to meet local energy demands, the majority of which left the county. Approximately half of the energy was used as a transportation fuel (gasoline and diesel), with large amounts also used to meet end use electrical demands and end use natural gas heating demands. Primary energy sources were comprised mainly of natural gas, gasoline, diesel, and biomass (wood waste and firewood).

REDWOOD COAST ENERGY AUTHORITY MISSION AND PURPOSE

The purpose of the Redwood Coast Energy Authority is to develop and implement sustainable energy initiatives that reduce energy demand, increase energy efficiency, and advance the use of clean, efficient and renewable resources available in the region for the benefit of the Member agencies and their constituents. To further that purpose, the Redwood Coast Energy Authority will work toward the following goals:

A. To lead, coordinate and integrate regional efforts that advance secure, sustainable, clean and affordable energy resources.

B. To develop a long-term sustainable energy strategy and implementation plan.

C. To increase awareness of, and enhance access to, energy conservation, energy efficiency, and renewable energy opportunities available to the region.

D. To add value to, but not duplicate, energy services offered by utilities and others serving the region in a manner that does not conflict with acting as a community choice aggregator.

E. To keep key decision makers and stakeholders informed of policy, regulatory, and market changes that are likely to impact the region.

F. To support research, development, demonstration, innovation, and commercialization of sustainable energy technologies by public and private entities operating in Humboldt County.

G. To develop regional capabilities to respond to energy emergencies and short-term disruptions in energy supply, infrastructure, or markets that could adversely affect Humboldt residents and businesses.

The CAPE is intended to support achieving these goals through strategies that specifically address: Regional Energy Planning & Coordination, Integrated Demand Side Management, Low-Carbon Transportation, ~~Energy Reliability & Security, Economic Development, Built Environment Efficiency, Education, Water & Waste, Transportation,~~ and Energy Generation & Utility Services.

VISION STATEMENT

The below vision statement was developed through the public comment process for the original draft of the Energy Element prepared by RCEA. It expresses the community qualities and characteristics that the CAPE aspires to achieve, expressed as how Humboldt County could be described in 2030.

In 2030…

Humboldt County is no longer a net importer of energy. We achieve a high degree of energy independence and self-sufficiency through high levels of energy conservation and efficiency combined with locally-produced and -managed energy generation. Most of our energy comes from renewable sources. Significantly less money spent on energy leaves the county.

Individual communities have developed greater energy self-sufficiency and independence as has the county overall. Citizens have a diversity of choices for how to meet their energy needs. We have much more local control over energy prices. We have been able to readily adapt to any major external changes in energy supply or technology.

Our rate of energy consumption is level, due to increasing conservation and efficiency to offset increases in growth-related demand.

Our overall quality of life is as good as or better than it was in 2005. The population is healthier as a result of leading energy-conserving lifestyles. It is safe, pleasant, economically favorable, and typical to have a lifestyle that doesn't consume much energy.

Energy conservation education has reached, and continues to reach, effectively, everyone in the county.

Energy considerations and decisions are integrated with all other decision-making arenas.

The County is energy efficient through neighborhood design. Good community planning has reduced sprawl. There are fewer automobiles and there is less automobile dependence. Public transportation is conveniently available and well utilized and walking, bicycling and other non-automobile forms of transportation are commonly used. There is much less consumption of energy from non-renewable sources for transportation.

All buildings are energy efficient. All new construction is done in the most energy efficient manner, starting with building design. All existing buildings have been upgraded to be more efficient. Energy efficiency is integral to building standards, which have flexibility and include meaningful incentives. Many homes and businesses produce more energy than they consume.

The County is a thriving research and development center and incubator for energy technology and related manufacturing, which is a stable source of local jobs.

Draft 2019
Strategies Update

Regional Energy Planning & Coordination

RCEA will take a leadership role to develop and advance strategic regional energy goals through economic development, funding, planning efforts, and education. This work will be done in coordination with RCEA's member governments, other local public agencies, local tribes, and other public and private stakeholders.

ECONOMIC DEVELOPMENT

Attract Energy-related Business. Collaborate with local economic development entities to attract technology developers, manufacturers, and energy service providers to locate operations in the County when appropriate.

Support Proactive Energy-related Business Development*.* Collaborate with local jurisdictions to identify and pre-assess locations and facilities for energy-related business ventures.

Support Energy-sector Workforce Development. Work with other local entities to provide training and continuing education that develops and maintains a qualified local workforce available to implement energy efficiency upgrades, renewable energy projects, and advanced-vehicle technology deployment.

FUNDING

Develop Regional Energy Funding Mechanisms*.* Offer support and act as the fiscal agent and funding clearinghouse for countywide energy programs.

Pursue Cap and Trade Auction Proceeds*.* Work regionally to access Cap and Trade auction proceeds and other State funding mechanisms to ensure effective, efficient, coordinated, and equitable resource allocation in the North Coast Region.

Develop Job Development Incentives*.* Collaborate with local economic development entities to identify opportunities for developing jobs in the field of energy conservation, efficiency, and renewable sources.

Implement Energy Project Financing. Work with local economic development entities and/or financial institutions to develop and implement financing programs that enable residents and businesses to implement energy efficiency and renewable energy projects.

Facilitate Financing Mechanisms. Facilitate Property Assessed Clean Energy (PACE) and other financing programs that access the needed capital to deploy regional energy independence strategies.

Develop Local Energy Investment Programs. Work with local economic development entities and financial institutions to develop programs and resources that facilitate local community investment in and/or ownership of energy efficiency and renewable energy projects.

PLANNING

Support Carbon Sequestration. Support the development and deployment of mechanisms for retaining carbon in region's abundant natural areas and working lands.

Assist with Climate Action Planning*.* Work with local jurisdictions to complete greenhouse gas inventories, set greenhouse gas reduction targets, and develop climate action plans.

Support Climate Change Adaptation. Work with other local entities to conduct a climate change risk assessment and develop an adaptation plan consistent with the best-practices guidance provided by the California Natural Resources Agency and California Emergency Management Agency.

Support Countywide Strategic Energy Planning. Coordinate an effective energy strategy based on self-sufficiency, development of renewable energy resources and energy conservation that is actively implemented countywide through Climate Action Plans, General Plans and the Redwood Coast Energy Authority's Comprehensive Energy Action Plan.

Encourage Adoption of Energy Elements. Encourage the adoption of energy elements in other local and regional jurisdictions. Periodically review local Energy Elements and recommend updates, as necessary, to reflect changing technologies for the generation, transmission, and efficient use of energy.

Assist with Energy Emergency Response Procedures. Assist the Humboldt County Office of Emergency Services in the preparation of energy emergency response procedures for the Humboldt County Emergency Response Plan.

Encourage Energy Policies and Plans*.* Encourage other jurisdictions and entities, including the cities in Humboldt County, to adopt and implement sound energy plans and policies, to include energy elements and/or energy policies in their general plans and ordinances. Advocate and disseminate energy planning strategies, policies, and other information.

EDUCATION

Maintain an Energy Resource Center. Operate an energy resource center open to the public and provide energy conservation, energy planning, renewable energy, and energy-efficient building design and retrofit information.

Hold Regional Energy Forums. Serve as a forum for addressing countywide energy issues.

Develop Public Displays. Encourage and assist development of educational displays for exemplary renewable energy and distributed energy systems installed throughout Humboldt County. Displays should provide county residents and businesses with information on how the systems work and how well they perform; and should inform county residents about the importance, benefits, and associated impacts of developing local energy resources.

Provide Energy Efficiency Education and Training. Provide community education on energy issues, including the benefits of reduced energy consumption, and increased energy efficiency. Collaborate with schools and colleges for energy-related research, education, and conservation practices.

Integrated Demand Side Management

RCEA will use an Integrated Demand Side Management (IDSM) approach to match and enhance customer energy use with intermittent clean and renewable energy supplies. An additional priority will be placed on energy resiliency and independence.

INTEGRATED DEMAND SIDE MANAGEMENT STRATEGIES

Support Member Agency and Local Government Energy Management. Support member agencies in managing their energy consumption. RCEA will support varying activities that reduce and align energy use with available clean and renewable supplies to reduce costs while aligning to performance-based action plans and Greenhouse Gas Emission Reduction goals. Additional activities will be prioritized where they support energy resiliency and independence.

Support Implementation of Codes and Standards. Support the local implementation of Title 24 building energy codes, Title 20 appliance efficiency standards and individual projects that strive to achieve energy efficiencies that exceed state or local requirements. Support the consideration and adoption of above code energy ordinances.

Promote No Regrets Energy Efficiency, Solar and Storage Permitting. Support local ordinances that streamline permitting processes for energy efficiency, solar and storage technologies.

Assist with Facility Benchmarking. Assist local governments with facility benchmarking to evaluate and track the energy performance of non-residential buildings.

Support Zero-Net–Energy Standards. Support the State's goals related to residential and commercial net-zero-energy standards along with other green building standards that align to RCEA's IDSM strategies.

Conduct Community Engagement. Provide community facing information and resources that will support informed decision making as relating to customer energy use.

Support Energy Assessments. Support and encourage full knowledge of the costs and benefits (including product stewardship) of energy efficiency, conservation, generation and storage activities through assessments.

Integrate Distributed Energy Resources. Support, promote and integrate distribution-connected generation, energy storage, energy efficiency, electric vehicle and demand response technologies into new and existing customer facing programs.

Integrate a Distributed Energy Resource Management System. Integrate distributed energy resources into a unified system that can aggregate or automate demand response activities.

Support and Deploy Microgrids. Support and deploy energy microgrids, focusing on critical infrastructure and community facilities, that through onsite generation, energy storage, and advanced control systems provide energy resiliency and emergency-response capabilities as well as ongoing economic and environmental benefits.

Use Advanced Metering Infrastructure. Use advanced metering infrastructure to make informed, data driven program decisions.

ENERGY EFFICIENCY & CONSERVATION

RCEA will support energy efficiency and conservation as core strategies toward achieving the program's environmental, economic, and community goals. Where feasible, energy efficiency technologies will be controllable and integrated as a distributed resource. RCEA will:

Support electrification. Prioritize new programs and alterations to existing services that promote the use of air-source heat pump domestic hot water and space heaters, induction stoves and clothes dryers.

electric

Encourage Energy-Efficient Equipment. Encourage the use of the most energy-efficient equipment for space and water heating, ventilation, lighting, refrigeration, and air conditioning in all buildings and developments, including residential and commercial facilities.

Promote Performance Contracting. Promote residential and commercial performance contracting that is consistent with current best practices for energy efficiency and environmentally sound construction techniques.

Develop and Support Behavioral, Commissioning and Operations (BROs). Develop, promote and support programs that promote conservation, building system commissioning and operational changes that reduce or change the time of energy use.

Replace Plug Loads. Replace existing plug load devices and install line signaling smart technologies that save energy and provide an integrated solution that aligns with demand response and storage measures. Example include internet of things enabled lighting, water and space conditioning, dish and clothes washing and refrigeration.

DEMAND RESPONSE

RCEA will support and prioritize demand response programs that give ratepayers an opportunity to play a role in balancing energy load with renewable energy supply**.** Demand response programs and offerings will, where possible, integrate with distribution connected efficiency, solar and storage measures.

Support Time of Use. Notify, support and enable action from customers who express an interest in load shifting or shaving to reduce evening hour coincident demand**.**

Provide and Support Peak Day Pricing. Notify and support customer energy use changes during ~~summer~~ peak day events.

Enable Automated Demand Response. Install electrification, efficiency, and storage technologies that automatically reduce energy use during demand response events.

Implement Grid Connected Buildings. Implement grid connected buildings that allow for the curtailment of loads in descending order of priority.

DISTRIBUTED GENERATION & STORAGE

RCEA will support the deployment of distribution connected solar and storage technologies as core strategies toward achieving the program's environmental, economic, and community goals.

Administer and Implement the Public Agency Solar Program. Continue to implement the solar and energy-storage technical assistance program for public agencies; integrate grid-connected resources and microgrids as feasible.

Administer and Implement the Community Solar and Storage Program. Evaluate, design and launch community solar and storage program services that support the increased adoption of grid-connected solar and storage technologies.

Integrate Vehicle to Grid Storage. Integrate vehicle to grid storage solutions with transportation and IDSM goals and objectives.

Low-carbon Transportation

RCEA will decarbonize regional transportation through efforts to reduce vehicle miles travelled, increase advanced fuel vehicles adoption and fuel efficiency, and expand advanced fuel infrastructure.

REDUCE VEHICLE MILES TRAVELED

Strengthen Broadband Infrastructure. Support efforts to strengthen rural regional broadband infrastructure to facilitate remote access to educational and business opportunities, and deploy advanced, resilient grid management technology and integrated energy efficiency and demand response solutions.

Encourage Transportation-efficient Land Use Planning. Encourage infill, transit-oriented development, and walkable and bikeable communities through thoughtful zoning and land-use planning process.

Facilitate Multi-modal Transportation Infrastructure. Support improving multi-modal transportation options through regional trail networks, transit infrastructure, and complete streets infrastructure strategies that support walking, biking, and the use of public transportation.

INCREASE ADVANCED FUEL VEHICLE ADOPTION & FUEL EFFICIENCY

Electrify Transportation. Encourage local government and private fleets to maximize the use of low-carbon vehicles. Provide local incentives for electric vehicles.

Promote Advanced Fuels. Encourage the use of non-fossil sources of advanced fuels that reduce greenhouse gas emissions, which may include hydrogen, biodiesel, ethanol, and renewable diesel.

Promote PEV Adoption. Conduct public outreach campaigns to promote EV driving; fleet analysis. Provide web and in-person decision support. Conduct leadership by example among government agencies. Support low-carbon transportation initiatives at other agencies.

Promote Efficient Driving Practices. Promote the use of energy-efficient driving practices that improve fuel efficiency, such as moderate speed changes and legal speeds, anti-idling, and traffic-calming features.

Support Shipping Efficiency. Support the implementation of trucking efficiency technologies and best-practices, including idle-reduction technologies, aerodynamic retrofits, and low rolling resistance tires. Support the analysis of other potential transportation modes that could provide efficient shipping alternatives such as barge and rail.

EXPAND FUELING INFRASTRUCTURE

Develop Transportation Electrification Infrastructure. Develop and implement Electric Vehicle (EV) charging stations. Provide local incentives for EV charging infrastructure.

Develop Biofuels. Promote use of waste oils and other biomass sources for biofuels production. Focus on waste oils and other biomass that are not already being used for other purposes, and explore potential opportunities and issues of new technologies for biofuels production from local resources.

Streamline Permitting for PEV Charging Infrastructure. List PEV charging as a permitted use across a broad range of zoning classifications. If a zoning review is triggered, consider the EVSE as an accessory use to another permitted use whenever possible. Develop a standard EVSE permitting process that can be used across the North Coast Region, etc.

Promote Vehicle-to-Grid Connection. Promote integration of motor vehicles with the electric grid, including battery electric vehicles, fuel-cell vehicles, plug-in hybrid electric vehicles, and solar electric vehicles. Evaluate development status of vehicle-to-grid interconnect standards and the use of grid-connected vehicles for short-term energy storage.

Energy Generation & Utility Services

RCEA will address supply-side energy needs for Humboldt County through its existing Community Choice Aggregation program and development of new programs and initiatives as appropriate.

POWER RESOURCES

Maximize the Use of Local Renewable Energy to the Extent Technically and Economically Feasible and Prudent. Use the CCA program with its renewable energy targets, and programs supporting distributed energy resources, to achieve this aim.

Minimize Greenhouse Gas Emissions Associated with RCEA's CCA Program. CCA power mix has, at least, a 5% lower greenhouse gas emission rate than PG&E mix.

Reduce Regulatory Barriers. Support efforts to increase the efficiency of the energy systems permitting process and reduce any excessive regulatory barriers to renewable energy and distributed generation projects. Work to develop proactive strategies to reduce and mitigate the environmental and community impacts of potential energy projects.

Maximize Renewable Energy Content of RCEA's CCA Program. CCA power mix is at least 5% more renewable energy (as defined by state law) than PG&E's power mix and reaches 100% clean and renewable content by 2025.

Ensure Diversity in Local Sources. Pursue development of a diverse, locally produced energy supply, with an emphasis on renewable resources, that are price-competitive in the California market and that can be generated in a way that minimizes adverse environmental impacts.

Promote Energy Feasibility Studies. Encourage and support feasibility studies of local wind, solar, hydro-power, and ocean energy resources. Make recommendations on preferred alternatives that are consistent with the County's goals for energy security and sustainability.

Power Resources: Distributed Generation

Designate "Renewable Energy Parks." Work with County and City planning departments to designate areas of the county preferred for renewable energy development.

Develop Distributed Generation. Encourage studies to identify key facilities throughout the county that would benefit from distributed generation and cogeneration energy systems. Encourage development of responsive environmentally preferable distributed generation and cogeneration energy systems where appropriate. Encourage and publicize demonstration sites.

Provide Education on Renewable Energy and Distributed Generation. Provide educational and promotional programs that encourage and demonstrate the use of renewable energy and environmentally preferable distributed energy generation and cogeneration systems.

Provide Feed-In-Tariff Power Procurement Program for Small Generators. Offer long-term contracts at a set rate for Renewable Portfolio Standard-eligible renewable energy generators of 1MW or smaller.

Power Resources: Solar

Support Solar Energy Development. Support local efforts to develop solar electric systems and solar hot water systems in the county. Support development of local training programs for solar contractors and installers. Educate the public about the benefits of solar energy systems. Develop programs that facilitate an increase in the number of solar energy systems in the County.

Power Resources: Offshore Wind

Pursue Offshore Wind Energy. Work with public and private entities to develop offshore wind energy off of Humboldt County's coastline, and support establishing Humboldt Bay as a west-coast hub for the offshore wind industry.

Power Resources: Onshore Wind

Promote Large-Scale Wind Energy. Provide information about the potential for cost effective commercial-scale wind farms in the county. Educate the public about the benefits and impacts of wind energy systems. Work with utilities, local government, and private companies to develop onshore wind energy projects.

Power Resources: Bioenergy

Support Biomass Fuels Reduction and Utilization. Develop strategies and technologies for improved biomass utilization in ways that effectively support restoration objectives and fire management priorities. Coordinate with local agencies, communities, and landowners to develop biomass energy plans that are consistent with sustainable forest management, hazardous fuels reduction, fire safety, and restoration needs.

Contract for 20MW Local Biomass Energy. Contingent on price and market conditions, contract for a target of around 20MW of local biomass energy.

Promote Small-scale Biomass Generation Sites. Monitor feasibility of smaller and/or mobile biomass electric generators fed with wood waste and very small diameter logs (e.g., from thinning for fire safety and timber harvest slash in National Forest areas). If/when technology proves feasible and cost effective, promote its use in county areas near National Forests where existing electric transmission lines are available.

Pursue Biogas Development. Support HWMA and others in the development the development of a food waste digester. Develop and publicize dairy biogas demonstration sites and work with local farm organizations to promote dairy biogas energy systems where appropriate. Publicize the use of biogas at existing local wastewater treatment facilities and encourage its use at additional facilities where appropriate.

Power Resources: Wave and Tidal

Pursue Wave and Tidal Energy Development. Build on the previous WaveConnent and CalWave projects to explore and evaluate opportunities for local wave and tidal energy research, development, and pilot-deployment.

Power Resources: Hydro

Support Existing and New Local Small-scale Hydroelectric Power. Evaluate options for contracting with existing small hydroelectric projects as well as the development of new small-scale run-of-the-river hydroelectric projects that would be compatible with environmental and cultural priorities. Encourage appropriate local agencies to prepare an updated assessment of small hydroelectric resources potential in the county.

UTILITY ENERGY SERVICE

Minimize Energy Interruptions. Work with local utility providers to minimize impact of power outages.

Provide Energy via Direct Access or Core Transport Agent Agreements. Explore the feasibility of RCEA acting as an electricity provider through direct access and/or acting as a natural gas core transport agent for local energy customers.

Review Utility Options. Review the effectiveness of PG&E in meeting Humboldt County's long-term energy needs, and evaluate the feasibility of establishing a local municipal electric utility.

RATES & TARIFFS

Provide Community Choice Aggregation Program Customer Rate Savings. Provide customer savings relative to corresponding PG&E generation rates and with PG&E PCIA fees factored in averaging at least $2 million per year.

Provide Electricity Buyback. Provide a net energy metering program that encourages more distributed local generation and more equitably compensates such generation.

Retain and/or Redirect Rate-Payer Dollars Back into Humboldt County. Work to maximize the amount of rate-payer dollars redirected back into Humboldt County when taking into consideration local power procurement, customer rate savings, local program spending, and allocations toward building the reserve/contingency fund for RCEA's Community Choice Aggregation program.

Provide Match Funding for State, Federal, and Foundation Energy Grants. Support bringing resources into Humboldt County to pursue CCA community energy goals.

Support Time of Use Rates. Support customer transitions to time of use rates.

TRANSMISSION & DISTRIBUTION INFRASTRUCTURE

Perform Transmission Assessments and Monitoring. Encourage development of long-term transmission assessments and, if necessary, electrical transmission grid expansion plans. Monitor local electricity transmission system planning to ensure that projected growth areas are adequately served and to support the development of local renewable energy projects.

Upgrade the Electricity Transmission and Distribution System. Upgrade the regional transmission and distribution electrical grid to enable increased development of both utility-scale renewable energy projects as well as community-scale distributed generation systems, including capability to export surplus renewable electricity generation from Humboldt County to other areas of the state.

From:	EnergyPlan2019@RedwoodEnergy.org
To:	Lori Taketa
Subject:	FW: solar before onshore wind, please
Date:	Monday, September 16, 2019 12:36:53 PM

Public comment

Nancy Stephenson
Community Strategies Manager | Redwood Coast Energy Authority
(707)269.1700 x 352 | www.RedwoodEnergy.org

From: Edith F Butler [redacted]
Sent: Monday, September 16, 2019 12:22 PM
To: EnergyPlan2019@RedwoodEnergy.org
Subject: solar before onshore wind, please

To RCEA,
Please give higher priority to residential solar energy generation and less priority to **onshore** wind energy generation.

Thank you.

Edie Butler
[redacted]
Eureka, CA

From: Mary Scanlon-Hill [redacted]
Sent: Monday, September 16, 2019 1:59 PM
To: EnergyPlan2019@RedwoodEnergy.org
Subject: Carbon neutral fuel plant

Hi there,
I don't know if this is the appropriate method of commenting or sharing this idea but I thought "why not?". So several months ago a family member sent me a video about a carbon equestrian technology company in Canada(I think) that is producing fuel that can power conventional combustion engine vehicles. I looked into the company at the time and they seemed legitimate. It is not a final solution for our transportation needs but would certainly make a nice bridge. It seems to me that a government funded plant would be ideal around here since we are so remote and reliant on fossil fuels for our transportation needs. It would be a job creator and security measure. If the local government couldn't fund the whole thing, maybe a partnership with a local company like Renner Petroleum?
Anyway, the original video that I saw is linked below.
https://youtu.be/Mb_8DJF6Hp0

Best of luck because we are all going to need it!
Mary

Humboldt Redwood™

Redwood Coast Energy Authority September 17, 2019
Attention: Matthew Marshall / Richard Engel
633 3rd Street
Eureka, CA 95501

Re: Comprehensive Action Plan for Energy ("CAPE") Update

Executive Summary

We appreciate the opportunity to comment on the role of biomass in Redwood Coast Energy Authority's ("RCEA") long-term portfolio planning. Consistent with long-term planning many assumptions are necessary and we assume RCEA's assumptions may include:

Variable	Assumption	Potential outcomes
Local renewable energy landscape	Several local projects currently in planning stages include (i) onshore wind farm, (ii) offshore wind farm, and (iii) various solar/storage projects may change the local renewable energy landscape.	Local renewable energy landscape may change dramatically providing more options if projects reach completion. However, many hurdles remain for projects and many of these projects will have variable time of day production cycles versus consistent and predictable baseload production to meet the energy demand.
Renewable energy -cost to procure	Renewable energy procurement costs may increase or decrease. .	Federal government subsidies single biggest driver of return on investment and subsidies are beginning to sunset. For example: Federal renewable energy investment tax credit percentage decreases beginning in 2020 through 2022. Increasing demand may increase the cost to procure wind, hydro and solar energy. Potential for the renewable energy market to become supply constrained due to lack of subsidies and increasing demand.
Resource Adequacy ("RA")	Renewable energy limitations	Certain renewable resources such as hydro, wind, solar impact long run adequacy planning in that down periods need to be addressed through additional procurement requirements. Biomass baseload capacity can be consistently relied upon and assists in RA planning.

The variables discussed above are difficult to forecast and the potential unknown outcomes may impact decisions made today regarding the long-term renewable energy portfolio. In the discussion to follow we will address the following topics:

- *Humboldt Redwood Company's ("HRC") commitment to sustainable forestry practices*
- *HRC's investment in Best Available Control Technology*
- *Local Economic Output for forestry products industry*
- *Biomass alternatives for wood waste*
- *Local Procurement/Control.*

Generally, the narrative to follow addresses why a successful Humboldt County initiative such as RCEA's Community Choice Aggregate program should continue to support biomass power and the local economic output provided by the forest products industry dependent on biomass by including biomass power as a significant source of their renewable energy portfolio for the long-term.

There will be many viewpoints presented during the public comment process and it is difficult to assess whether the general consensus of Humboldt County residents will be adequately represented, or will the opinions of a few be influential. We certainly cannot speak for the residents, but we believe the majority of the hard working residents of Humboldt County would support RCEA's long term support of the forest products industry and the local economic output the industry provides to Humboldt County.

HRC's Commitment to Sustainable Forestry Practices

HRC was created in July 2008 through the reorganization of the former Pacific Lumber Company (PALCO) and related entities. HRC consists of approximately 327 square miles (209,300 acres) of coast redwood and Douglas-fir timberlands spanning across 60 Northern California coastal watersheds. HRC manages productive timberlands with a high standard of environmental stewardship while operating a successful business. Humboldt Sawmill Company, LLC ("HSC") works together with HRC to supply the marketplace with environmentally responsible lumber and timbers.

The HRC/HSC cogeneration/biomass facility in Scotia is a critical component of our business and provides a renewable source of energy for Humboldt County. We are the only facility in the county that sources our feedstock entirely from mill residuals. These residuals, including chips, bark, sawdust and shavings are generated from manufacturing high-quality lumber products from logs from sustainably managed forests, including those coming from HRC which is Forest Stewardship Council® certified as well-managed (C031337). HRC harvests less conifers than it grows each year, ensuring a growing forest and sustainable feedstock.

While the sustainable management of the county's forests supply logs to our own sawmill, there is also an added benefit of reducing forest fuels. The state has a goal of treating 500,000 acres per year to create wildfire resilient forests. We and other forestland owners are contributing towards that goal through timber harvest plans and other forest fire prevention projects. Our cogeneration facility in Scotia is a crucial component to continuing the work of creating wildfire resilient forests

HRC's investment in Best Available Control Technology & New Equipment

Since we acquired the cogeneration facility in 2015, HRC/HSC has invested approximately $9,000,000 in capital upgrades to the facility to ensure stringent air quality standards are met.

Capital upgrades include:

- Rebuilt emission control systems, including:
  - ✓ Electrostatic Precipitator internals for both existing boilers and ongoing rebuild of the third boiler

  - ✓ Upgrades of the electrostatic precipitator subsystems such as heaters, rappers, tampers, and controls improving performance and effectiveness.
  - ✓ Replacement of visual emission monitoring analyzers
  - ✓ Upgraded Data analysis and handling system
  - ✓ Upgrade of stack probes
- Rebuilt turbine for energy conversion efficiency
- Replaced Air Pre-Heater tubes to improve boiler combustion and reduce emissions.
- Replaced ignition burners with new design to better control combustion during upset conditions or periods of wet fuel.
- Replaced 4 motor operated control valves on Cooling Tower
- Replaced cooling tower media and rebuilt header system.
- Replaced cooling tower fans and gearboxes
- Rebuilt main steam stop valves
- Replaced multiple isolation valves on steam system, reducing steam leaks
- Upgraded communications from emission system components to data analysis and handling system
- Installed mufflers on superheat safety to reduce noise in the community during upset conditions.
- Rebuild boiler grates utilizing upgraded material design to improve uptime and combustion while lowering emissions.

Local Economic Output for Forestry products industry

HRC/HSC has 283 full-time employees in the areas of forestry sciences, manufacturing, sales and administrative positions. Additionally, through contract logging, construction, transportation and other professional services, indirect employment is roughly another 566 workers within Humboldt County alone.

HRC/HSC annually spends over $22.5 million in local purchases, pays nearly $1 million in property taxes, and has given over $100,000 in direct giving to local groups. HRC/HSC employees were paid over $23 million in wages and directly added over $116 million to the economic output of Humboldt County.

Research presented at the Coast Redwood Science Symposium in 2016, by J. Henderson, R. Standiford, and S. Evans titled “Economic Contribution of Timber Harvesting and Manufacturing to North Coast Redwood Region Counties” included an analysis of Humboldt County. They determined that for every job in the timber industry there are nearly 3 other jobs created. They also report a significant multiplier effect for the biomass-related jobs in the county.

Table 5—Humboldt forest products industry's economic contribution indicating direct effect values for forestry-related sectors and resulting indirect and induced effects on all other sectors aggregated at the 2 digit NAICS level (the total effect is indicated along with the total county economy size, the total effect expressed as a percentage of the total county economy, and the multiplier value of the forest products industry)

	Employment	Labor income ($M)	Output ($M)	Value added ($M)
Forestry and logging	769.1	42,002	79,030	46,462
Wood biomass	60.3	9,129	129,476	78,164
Solid wood	823.8	55,059	212,265	58,000
Wood furniture	65.4	2,703	8,460	2,807
Subtotal of direct effects	1,718.5	108,893	429,232	185,432
Subtotal (indirect & induced effects)	3,320.2	136,234	228,160	376,994
Total (total effect)	5,038.7	245,127	657,393	562,426
Total county economy	68,409.1	4,275,694	8,389,036	4,722,941
Total effect as % of county	7.4%	5.7%	7.8%	11.9%
Multiplier effect	2.93	2.25	1.53	3.03

Monetary values in 2013 dollars and expressed in thousands ($M).

Using the multipliers derived from that study, the economic benefit of HRC/HSC to Humboldt County is calculated as follows:

Overall the companies support over 850 jobs with wages of $45.5 million and economic output of $117.3 million through an additional 566 jobs accounting for $29.7 million in wages and an additional $116.9 million in economic output for the County of Humboldt

Alternative Uses for Biomass

While our facility is currently only using feedstock generated from forest-products manufacturing operations, we are currently operating two of three boilers and therefore have the potential to receive feedstock from other sources, such as woody material from fuel reduction projects. It is critical biomass facilities are kept operational to avoid disposing of feedstock in a manner that result in increased emissions. One of the most common forms of disposing of woody material is pile burning. The Placer County Air Pollution Control District sponsored — in cooperation with the UC Berkeley Center for Forestry, United States Forest Service (USFS) Rocky Mountain Research Station Missoula Fire Lab, and UC Davis Biological and Agricultural Engineering — a case study to quantify the air quality and GHG benefits of using biomass for renewable energy versus open pile burning[1]. The report concluded that when compared to open pile burning, emissions from a biomass plant have a 98% to 99% reduction in $PM_{2.5}$, carbon monoxide, nonmethane organic compounds, and black carbon. They also have a 20% reduction in nitrous oxides, and CO_2e greenhouse gases. Given these reductions in emissions, biomass facilities are critical to meet county and statewide emissions reductions targets and reduce wildfire risk and intensity.

[1] Forest biomass diversion in the Sierra Nevada: Energy, economics and emissions, by Bruce Springsteen, Thomas Christofk, Robert A. York, Tad Mason, Stephen Baker, Emily Lincoln, Bruce Hartsough and Takuyuki Yoshioka, 2015.

Biomass gasification has gained increased attention in the last couple decades as an alternative to fossil fuels. We continue to monitor and support this new technology and await viable commercial applications to see if this process can be successful at scale. It should be noted that gasification facilities require a specific type of chip with a specific fuel moisture content. Biomass facilities can take a wider range of chips and bark from various species and with a wider range of fuel moisture content. As this technology develops, it could develop into a feasible alternative, but at this point in time biomass/cogeneration facilities represent the best use for forest and sawmill residues.

We would like RCEA to consider the scenario where biomass facilities in Humboldt County are no longer operational, whatever the reason may be. We currently are an outlet for sawmill residuals from our facility but also for other sawmills in the redwood region. If this outlet were not to exist, sawmills would look to the next closest biomass facility, that being in the Redding area, assuming facilities in this area could accept additional volume. Tens of thousands of loads of sawmill residuals are generated annually from multiple sawmills. The carbon footprint of hauling this material to Redding would be significant and can be avoided by maintaining or expanding the use of biomass energy in Humboldt County.

Local Procurement/Control

Humboldt County is somewhat remote, with a sense of rural ruggedness and self-sufficiency. Producing local, renewable energy within our community versus relying on importing energy from outside the redwood region has benefit in both, supporting our local community through employment and financial contribution, and through access to reliable baseload renewable energy across the local, regional grid. As PG&E faces increased scrutiny regarding maintenance and management of their aging distribution infrastructure, importing energy from outside-sources can increase risk of power interruptions and outages. RCEA is able to prioritize these local benefits and control which enhances the resiliency of the Humboldt County energy system.

Conclusion

Due to the many advantages the biomass industry brings to Humboldt County, we ask RCEA to give consideration to maintaining biomass as a significant piece of your renewable energy portfolio as you work to update the Comprehensive Action Plan for Energy. We end this public comment letter with an invitation to come visit our cogeneration facility in Scotia and/or to see firsthand the sustainable management of our forests that provide the fuel for our facility. Thank you for the opportunity to comment.

Sincerely,

John Andersen
Director, Forest Policy
Humboldt Redwood Company

From:	EnergyPlan2019@RedwoodEnergy.org
To:	Lori Taketa
Subject:	FW: the next ten years are crucial
Date:	Tuesday, September 17, 2019 2:46:04 PM

Public comment:

Nancy Stephenson
Community Strategies Manager | Redwood Coast Energy Authority
(707)269.1700 x 352 | www.RedwoodEnergy.org

From: [redacted]
Sent: Monday, September 16, 2019 8:42 PM
To: EnergyPlan2019@RedwoodEnergy.org
Subject: the next ten years are crucial

The CAPE is disappointing because of RCEA's expectation of continuing to burn mill waste for electricity until 2030. I've been looking at our incredibly inefficient, heavy carbon-emitting biomass plants as a stopgap measure for now. But apparently RCEA is content with them--air pollution and all. Will we ever be rid of biomass? What is the plan to stop emitting so much carbon?

According to the best scientific consensus we have, we need to slash our emissions in half during the next decade in order to avoid total disaster. We need a plan to de-carbonize. Burning biomass does absolutely nothing to help. It takes decades for new growth to re-sequester the carbon emitted by burning wood. Do we have such a luxury of time? You can say biomass is a little better than fossil fuels IF we manage to reverse global deforestation and live long enough. I was hoping for so much more innovation and bold action.

There are other ways to balance the grid. What is the plan to stop emitting so much carbon?

Martha Walden

[redacted]

[redacted]

Sent from Windows Mail

From: EnergyPlan2019@RedwoodEnergy.org
To: Lori Taketa
Subject: FW: CAPE Comments and Biomass
Date: Wednesday, September 18, 2019 9:16:40 AM

Public comment:

Nancy Stephenson
Community Strategies Manager | Redwood Coast Energy Authority
(707)269.1700 x 352 | www.RedwoodEnergy.org

From: Jared Gerstein [redacted]
Sent: Wednesday, September 18, 2019 9:09 AM
To: EnergyPlan2019@RedwoodEnergy.org
Subject: CAPE Comments and Biomass

Please accept the following comments regarding RCEAs Comprehensive Action Plan for Energy (CAPE).

RCEA should promote use of local energy sources by preferentially purchasing power from local producers. Sources of local energy are mainly derived from wood, wind, waves and solar. The largest current source of local energy is wood or biomass- this is because we live in one of the most productive forests in the world which naturally converts solar energy and CO2 into wood-organically and automatically. This unique local energy source can be converted into electricity using existing biomass energy plants (Scotia, Fairhaven & Bluelake). The inputs to these biomass plants comes from waste-streams that otherwise would be expensive and harmful to dispose of. Local sawmills produce an enormous amount of sawdust and bark that must be disposed of in some manner. The most efficient use of this mill residue is conversion to electricity in local biomass plants- the alternative involves trucking it great distances to be burned in a biomass plant in another community. The mill waste cannot be composted fast enough to keep pace with production and composting is a net carbon producing activity because carbon is released into the atmosphere via decomposition processes and no energy is captured to offset the carbon loss.

An alternate energy source for biomass plants is forest residue from forest thinning projects. Decades of fire suppression combined with very productive forest growth rates has resulted in a vast supply of stored carbon in forests that needs to be mechanically removed to reduce forest fuel loading. Mechanical forest fuel reductions (thinning projects) reduce the risk of wildfire by removing and rearranging fuels into a structure that results in lower intensity fires that can be managed more effectively by fire crews. Lower intensity fires reduce the size and scale of wildfires, which reduces carbon and smoke emissions from fires and structure loss within rural communities. However the scope and scale of mechanical fuel reduction activities is severely hampered by the lack of a consumer for the fuels produced by this activity. Local biomass plants could be a consumer of this material.

Wind and wave power seem attractive and could be a future power source- but so far have not been able to get through the engineering or public review process.

Solar power on residential roof tops is a local energy source and seems to be increasing slowly. RCEA could encourage this local renewable energy source by purchasing power from producers at retail rather than wholesale rates. At this point there is little incentive for residents to install solar systems that exceed their direct needs in order to sell power into the grid. Higher prices paid to solar producers may encourage people to install larger systems.

In summary, please keep biomass derived energy in the local RCEA power mixture and encourage upgrades to the existing facilities or development new consumers of biomass fuels. RCEA should also pay higher rates to local solar producers to encourage increased production. Wind and waves should be pursued for future energy production.

Thank you for considering my comments,

Jared Gerstein
Registered Professional Forester #2826
Baldwin, Blomstrom, Wilkinson and Associates, Inc.
PO Box 702
Arcata, CA 95518
(707) 825-0475 (office)
[redacted]

Date: September 18, 2019

To: Redwood Coast Energy Authority

From: James L. Able

Subject: Biomass Utilization and Biomass Energy-Action Plan for Energy

I am a consulting forester who has lived and worked in Humboldt Country since 1968. I have been a member of the County Forestry Review Committee since its conception in the 1980's. My professional experience has been with the forest industry, non-industrial landowners, environmental organizations (Save the Redwood League), and the State of California to name a few. I am a California Licensed Forester.

The conservative use of biomass for both "clean energy" and as a forest and range land management tool is practiced throughout the world.

A most immediate problem in Humboldt County and California is uncontrolled fire. The forests and rangelands of Humboldt county have, through lack of management have been allowed to develop a landscape of dead, dying trees, as well as dense "understory" smaller trees and brush that is highly flammable. For the past 30 years a philosophy has endured in which "let nature take its course" has prevailed. This has resulted in highly flammable over stocked forests and encroached rangelands.

Today there is a great emphasis to control the massive forest fires of the past 10 years. The removal of excess and dense vegetation is vital to "fire proofing" forests and rangelands. There are a number of ways which these conservation practices can be done. One is through biomass extraction. In areas where biomass is purchased for electricity or fuel, removal of this fire prone material is very effective. Costs are reduced and may even be turned into profit. I have actually watched a "raging" forest fire enter an area of thinned and vegetation removal. The results were phenomenal, the fire died down and "just crept" through the area making it very easy to control.

Benefit to the utilization of biomass is it is a renewable sustainable source of non-carbon polluting fuel for energy. It utilizes a local product and its sale can provide an immediate economic incentive to land owners all the while improving their (private or public) forests and woodlands. My greatest interest in biomass utilization is it allows land managers both public and private a tool to help manage and conserve their forests and rangelands

A source of sustainable "clean or carbon neutral" energy as opposed to gas and oil. This county has an over-abundance of biomass. It competes with wind and solar except that it is available 24/7 "rain or shine".

Thank you

James L. Able RPF #900

[redacted]
Eureka, California [redacted]
[redacted]

From: EnergyPlan2019@RedwoodEnergy.org
To: Lori Taketa
Subject: FW: CAPE comments
Date: Wednesday, September 18, 2019 4:04:05 PM

Public Comment:

Nancy Stephenson
Community Strategies Manager | Redwood Coast Energy Authority
(707)269.1700 x 352 | www.RedwoodEnergy.org

-----Original Message-----
From: Patrick Carr [redacted]
Sent: Wednesday, September 18, 2019 3:18 PM
To: EnergyPlan2019@RedwoodEnergy.org
Subject: CAPE comments

Thank you for the opportunity to comment on the CAPE planning process.

My biggest concern for RCEA over the next 5-10 year period is around the Authority's utilization of wood waste biomass. I am aware that RCEA faces both operational and political constraints that may make biomass energy an attractive option. However, I think it is vital that over the course of the next few years RCEA needs to examine several factors that biomass may impact.

First, with the passage of the "100% clean and renewable by 2025" goal by the board last March, it seems vital to recognize that biomass energy is certainly not "clean." Particulates and other air pollutants are released by the two biomass plants in quantities that could endanger human health. If RCEA is to continue to use these plants, it places the goal of "clean" in jeopardy. Colin Fiske and Katy Gurin proposed that RCEA could possibly continue to use biomass electricity and still reduce air pollution by mitigating the plants' impacts by, for example, paying to retrofit local wood stoves in the air pollution catchment areas for the plants. I would hope that RCEA would consider that if on other grounds you must continue to use biomass electricity.

"Renewable electricity" is ordinarily considered to be electricity that is carbon neutral. I am aware that wood waste biomass is considered renewable under State of California RPS standards. However there is evidence that, despite the state's imprimatur, this energy source may be a net contributor to GHG emissions given that copious amounts of CO2 are released and that forest potential for sequestration is reduced given the short timber harvest rotations that are conventionally employed. I would urge that RCEA, again if it is deemed that wood waste biomass must remain a major part of the energy mix, research the life cycle issues involved in the burning of the wood for electricity versus other options for wood waste, such as an industrial scale compost facility.

Finally, it is well known that RCEA pays a rate for the biomass above that paid for other renewables, and I am aware that biomass plays a significant role both in enabling RCEA to meet peak needs while also maintaining local baseload coverage. *However, with the potential for local wind development, as well as a variety of our-of area wind options available to potentially cover caseload needs, it seems that there may be other options. Paying top dollar for this energy source may stunt the transition to true renewable energy.

Thank you for considering these points.

Patrick Carr

***In a 9/19/19 email, Mr. Carr requested that this sentence read as follows:**

"However, with the potential for local wind development, as well as a variety of out-of-area wind options available to potentially cover baseload needs, it seems that there may be other options."

From: Walt Paniak
To: Lori Taketa
Subject: Cape comment
Date: Wednesday, September 18, 2019 9:52:25 AM
Attachments: health-organizations-letter-biomass.pdf

This brief letter summarize the Medical community views of biomass emissions.

Walt

September 13, 2016

Dear Senator/Representative:

The undersigned public health, medical and nursing organizations urge you to oppose policies that would encourage or expand the use of biomass for electricity production. Biomass is far from "clean" – burning biomass creates air pollution that causes a sweeping array of health harms, from asthma attacks to cancer to heart attacks, resulting in emergency room visits, hospitalizations, and premature deaths.

Biomass uses fuel sources, or feedstocks, whose combustion harms human health, including wood products, agricultural residues or forest wastes, and highly toxic construction and demolition waste. Burning biomass from any source generates immediate dangerous air pollution that puts health at risk.

Among the most dangerous of these emissions is particulate matter, also known as soot. These particles are so small that they can enter and lodge deep in the lungs, triggering asthma attacks, cardiovascular disease, and even death.[i] Particulate matter can also cause lung cancer.[ii]

Biomass combustion also creates nitrogen oxide emissions, which are harmful in their own right and also contribute to the formation of ozone smog and particulate matter downwind.[iii] Ground-level ozone pollution can trigger asthma attacks and cause premature death, and newer research shows possible links to reproductive and central nervous system harm.[iv]

Burning biomass also creates carbon monoxide, which leads to headaches, nausea, dizziness, and in high concentrations, premature death;[v] and carcinogens, including benzene and formaldehyde.[vi]

The dangerous air pollution from burning biomass endangers some people more than others. Millions of infants and children, older adults, individuals with respiratory or cardiovascular disease or diabetes, and individuals with lower incomes face a higher risk of suffering serious health effects from these pollutants.[vii]

In addition to emitting harmful conventional pollutants, some biomass processes also increase carbon emissions that contribute to climate change. The U.S. Environmental Protection Agency's Science Advisory Board is currently evaluating available research to answer questions about the net carbon emissions that result from burning biomass. In their 2012 letter to EPA from an earlier review, the Science Advisory Board noted that "[c]arbon neutrality cannot be assumed for all biomass energy a priori" and described the processes that can make biomass increase carbon emissions.[viii]

Scientists must be allowed to continue to review these impacts. The United States is already experiencing health harms as a result of climate change. Increased temperatures lead to heat-related illnesses and deaths and help make the formation of ground-level ozone more likely. More droughts lead to elevated particulate matter levels. More frequent and severe extreme weather events harm both physical and mental health. These trends are projected to continue, along with increased health threats from vector-borne diseases; food insecurity; food- and water-borne diseases; worsened allergy seasons; and many more.[ix]

Burning biomass creates proven harm to human health through direct air pollution impacts, as well as the potential for increasing climate change. Because of those threats, the undersigned public health, medical and nursing organizations ask that you oppose policies that would encourage or expand the use of biomass for electricity production. We urge you to protect human health by supporting the development of truly clean, carbon-free sources of energy such as solar energy and wind power.

Sincerely,

Allergy & Asthma Network

American Academy of Pediatrics

American Lung Association

American Public Health Association

Asthma and Allergy Foundation of America

National Association of County & City Health Officials

National Environmental Health Association

Physicians for Social Responsibility

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[i] U.S. Environmental Protection Agency. Integrated Science Assessment for Particulate Matter. 2009.
[ii] World Health Organization International Agency for Research on Cancer. IARC Monograph on the Evaluation of Carcinogenic Risks to Humans. Volume 109, Outdoor Air Pollution. Lyon: IARC (in Press).
[iii] U.S. Environmental Protection Agency. Integrated Science Assessment for Oxides of Nitrogen-Health Criteria. 2016.
[iv] U.S. Environmental Protection Agency. Integrated Science Assessment of Ozone and Related Photochemical Oxidants. 2013.
[v] U.S. Environmental Protection Agency, Integrated Science Assessment for Carbon Monoxide, 2010.
[vi] Naeher LP, Brauer M, Lipsett M, Zelikoff JT, Simpson CD, Koenig JQ, Smith KR. 2007. Wood smoke Health Effects: A Review. Inhalation Toxicology. 19:67-106.
[vii] U.S. Environmental Protection Agency, Integrated Science Assessment for Particulate Matter. 2009.
[viii] Swackhammer, Deborah L. and Madhu Khanna, letter to Lisa P Jackson, Administrator, U.S. Environmental Protection Agency on SAB Review of EPA's *Accounting Framework for Biogenic CO_2 Emissions from Stationary Sources*. September 28, 2012.
[ix] USGCRP, 2016: The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment. Crimmins, A., J. Balbus, J.L. Gamble, C.B. Beard, J.E. Bell, D. Dodgen, R.J. Eisen, N. Fann, M.D. Hawkins, S.C. Herring, L. Jantarasami, D.M. Mills, S. Saha, M.C. Sarofim, J. Trtanj, and L. Ziska, Eds. U.S. Global Change Research Program, Washington, DC, 312 pp. http://dx.doi.org/10.7930/J0R49NQX

From: EnergyPlan2019@RedwoodEnergy.org
To: Charles Minton; EnergyPlan2019@RedwoodEnergy.org
Subject: RE: Proposed energy mix
Date: Thursday, September 19, 2019 1:54:54 PM

Thank you for your comment; we'll add it to our comments that will be made public.
Sincerely,
Nancy

Nancy Stephenson
Community Strategies Manager | Redwood Coast Energy Authority
(707)269.1700 x 352 | www.RedwoodEnergy.org

-----Original Message-----
From: Charles Minton [redacted]
Sent: Thursday, September 19, 2019 12:59 PM
To: EnergyPlan2019@RedwoodEnergy.org
Subject: Proposed energy mix

RCEA should delete biomass from its mixture of clean energy sources in as much as it gives off huge amounts of CO2 as well as particulate matter especially where it's being implemented.

Sent from my iPhone

From: EnergyPlan2019@RedwoodEnergy.org
To: Gisele; EnergyPlan2019@RedwoodEnergy.org
Subject: RE: Energy Plan 2019
Date: Thursday, September 19, 2019 1:54:32 PM

Thank you for your comment; we'll add it to our comments that will be made public.
Sincerely,
Nancy

Nancy Stephenson
Community Strategies Manager | Redwood Coast Energy Authority
(707)269.1700 x 352 | www.RedwoodEnergy.org

-----Original Message-----
From: Gisele [redacted]
Sent: Thursday, September 19, 2019 1:16 PM
To: EnergyPlan2019@RedwoodEnergy.org
Subject: Energy Plan 2019

Thank you for taking my comment on RCEA's Clumate Action Plan. I strongly believe that RCEA should make mitigating climate change its first priority. I personally opted in to pay the extra money for what I was told would be clean, renewable energy. Biomass is not clean energy. The local plant emits almost 400,000 tons of CO2 every year! Other choices are already, and more will become available. Dirty local energy or non competitive pricing, should not get preference to clean energy. Please do not lock us into Biomass!
Thank you,
Gisèle Albertine
[redacted]
Arcata, 95521

From:	EnergyPlan2019@RedwoodEnergy.org
To:	Debra Kaufman; EnergyPlan2019@RedwoodEnergy.org
Subject:	RE: Get biomass out of our Energy mix
Date:	Thursday, September 19, 2019 1:57:16 PM

Thank you for your comment; we'll add it to our comments that will be made public.
Sincerely,
Nancy

Nancy Stephenson
Community Strategies Manager | Redwood Coast Energy Authority
(707)269.1700 x 352 | www.RedwoodEnergy.org

From: Debra Kaufman [redacted]
Sent: Thursday, September 19, 2019 12:50 PM
To: EnergyPlan2019@RedwoodEnergy.org
Subject: Get biomass out of our Energy mix

Dear RCEA folks, I am a customer and pay my extra $5/month to support alternative energy sources. It recently came to my attention that burning biomass is part of this energy mix. I was thinking that our energy was being provided through solar or wind and I guess I am sadly uninformed. Biomass plants emit close to 400,000 tons of CO2's every year and contributes to climate change. Even though this energy source is local, this isn't acceptable to me. How is this better that using regular PGE? Sincerely, Debra Kaufman
[redacted]
Eureka, CA. [redacted]

From: EnergyPlan2019@RedwoodEnergy.org
To: Sarah Scher; EnergyPlan2019@RedwoodEnergy.org
Subject: RE: Take biomass out of our energy mix
Date: Thursday, September 19, 2019 1:56:50 PM

Thank you for your comment; we'll add it to our comments that will be made public.
Sincerely,
Nancy

Nancy Stephenson
Community Strategies Manager | Redwood Coast Energy Authority
(707)269.1700 x 352 | www.RedwoodEnergy.org

From: Sarah Scher [redacted]
Sent: Thursday, September 19, 2019 12:51 PM
To: EnergyPlan2019@RedwoodEnergy.org
Subject: Take biomass out of our energy mix

Thank you for setting the goal of reaching 100% clean and renewable energy. I believe this is critically important to avoiding a climate catastrophe over the next 20 years. However, I think it is a mistake to include biomass in this mix. Humboldt county's biomass power plants emit almost 400,000 tons of CO2s every year. This is equivalent to doubling the number of cars in our county.

In addition, these plants are dirtier than coal, releasing over a ton of fine particulates every week. These particles increase the risk of asthma attacks, heart attacks, cancer, and premature deaths.

Thank you for taking my comment.

Sarah Scher, MD
McKinleyville, CA

From: EnergyPlan2019@RedwoodEnergy.org
To: Dianne Orsillo; EnergyPlan2019@RedwoodEnergy.org
Subject: RE: Biomass
Date: Thursday, September 19, 2019 1:56:08 PM

Thank you for your comment; we'll add it to our comments that will be made public.
Sincerely,
Nancy

Nancy Stephenson
Community Strategies Manager | Redwood Coast Energy Authority
(707)269.1700 x 352 | www.RedwoodEnergy.org

From: Dianne Orsillo [redacted]
Sent: Thursday, September 19, 2019 12:54 PM
To: EnergyPlan2019@RedwoodEnergy.org
Subject: Biomass

Thank you for taking comment on RCEA's CAPE I'm concerned about the biomass component of th plan. It is not clean energy. I read that it emits the equivalent of twice the amount of CO2 that the county cars emit. I also read that it is more polluting than coal.
I request that you do not continue to include it in the energy mix.
Thank you, Dianne Orsillo of Arcata

From: EnergyPlan2019@RedwoodEnergy.org
To: Patrick Carr; EnergyPlan2019@RedwoodEnergy.org
Subject: RE: CAPE comments
Date: Thursday, September 19, 2019 11:53:35 AM

No problem, Pat. We'll update it. Thanks!
Nancy

Nancy Stephenson
Community Strategies Manager | Redwood Coast Energy Authority
(707)269.1700 x 352 | www.RedwoodEnergy.org

From: Patrick Carr [redacted]
Sent: Wednesday, September 18, 2019 6:02 PM
To: EnergyPlan2019@RedwoodEnergy.org
Subject: Re: CAPE comments

Hi Nancy,

I realized I made two typos that may make understanding my comments more difficult. Both are in the next to last sentence, which should read:

However, with the potential for local wind development, as well as a variety of out-of-area wind options available to potentially cover baseload needs, it seems that there may be other options.

I hope you can add that content so my comments are more comprehensible. My apologies for the mistakes!

Pat Carr

On Wed, Sep 18, 2019 at 4:04 PM EnergyPlan2019@RedwoodEnergy.org <EnergyPlan2019@redwoodenergy.org> wrote:

> Thank you, Patrick. I'll include this with the other comments that will be made public.
> Best,
> Nancy
>
> Nancy Stephenson
> Community Strategies Manager | Redwood Coast Energy Authority
> (707)269.1700 x 352 | www.RedwoodEnergy.org
>
> -----Original Message-----
> From: Patrick Carr [redacted]
> Sent: Wednesday, September 18, 2019 3:18 PM
> To: EnergyPlan2019@RedwoodEnergy.org

Subject: CAPE comments

Thank you for the opportunity to comment on the CAPE planning process.

My biggest concern for RCEA over the next 5-10 year period is around the Authority's utilization of wood waste biomass. I am aware that RCEA faces both operational and political constraints that may make biomass energy an attractive option. However, I think it is vital that over the course of the next few years RCEA needs to examine several factors that biomass may impact.

First, with the passage of the "100% clean and renewable by 2025" goal by the board last March, it seems vital to recognize that biomass energy is certainly not "clean." Particulates and other air pollutants are released by the two biomass plants in quantities that could endanger human health. If RCEA is to continue to use these plants, it places the goal of "clean" in jeopardy. Colin Fiske and Katy Gurin proposed that RCEA could possibly continue to use biomass electricity and still reduce air pollution by mitigating the plants' impacts by, for example, paying to retrofit local wood stoves in the air pollution catchment areas for the plants. I would hope that RCEA would consider that if on other grounds you must continue to use biomass electricity.

"Renewable electricity" is ordinarily considered to be electricity that is carbon neutral. I am aware that wood waste biomass is considered renewable under State of California RPS standards. However there is evidence that, despite the state's imprimatur, this energy source may be a net contributor to GHG emissions given that copious amounts of CO2 are released and that forest potential for sequestration is reduced given the short timber harvest rotations that are conventionally employed. I would urge that RCEA, again if it is deemed that wood waste biomass must remain a major part of the energy mix, research the life cycle issues involved in the burning of the wood for electricity versus other options for wood waste, such as an industrial scale compost facility.

Finally, it is well known that RCEA pays a rate for the biomass above that paid for other renewables, and I am aware that biomass plays a significant role both in enabling RCEA to meet peak needs while also maintaining local baseload coverage. However, with the potential for local wind development, as well as a variety of our-of area wind options available to potentially cover caseload needs, it seems that there may be other options. Paying top dollar for this energy source may stunt the transition to true renewable energy.

Thank you for considering these points.

Patrick Carr

From: EnergyPlan2019@RedwoodEnergy.org
To: Judi Scharnberg; EnergyPlan2019@RedwoodEnergy.org
Subject: RE: Biomass
Date: Thursday, September 19, 2019 1:55:39 PM

Thank you for your comment; we'll add it to our comments that will be made public.
Sincerely,
Nancy

Nancy Stephenson
Community Strategies Manager | Redwood Coast Energy Authority
(707)269.1700 x 352 | www.RedwoodEnergy.org

-----Original Message-----
From: Judi Scharnberg [redacted]
Sent: Thursday, September 19, 2019 1:22 PM
To: EnergyPlan2019@RedwoodEnergy.org
Subject: Biomass

To the RCEA:
Biomass energy production in a Humboldt County is NOT currently clean energy. It emits close to 400K tons of CO2 every year, the equivalent of doubling the number of cars.
I lived in Thailand for two years and saw farmers bringing rice chaff by ox and cart to the biomass plant in Chiang Mai. The greenwaste was burned under high pressure to produce clean electricity. It can be done, and grants for modernization here must be explored. Until then the plants need to be shut down ASAP Regards, Judi Scharnberg 95521

CAPE COMMENTS 9/19
Ken Miller

EnergyPlan2019@RedwoodEnergy.org.

Comments on key components of the plan:

- **RCEA's mission, purpose, and vision – where should we be headed, and how do we get there?**
- **Regional energy planning and coordination – how can RCEA coordinate with other local stakeholders on energy planning, education, economic development, and funding to support our energy goals?**
- **Integrated demand side management – how can we ensure energy efficiency and match our energy loads with clean and renewable energy resources?**
- **Low-carbon transportation – how can we achieve a transition to clean transportation technologies and policies?**
- **Energy generation and utility services – what local energy resources should be developed? How should we balance energy cost with environmental quality**

My responses:

Mission

"Renewable energy microgrids pair onsite resilience with global sustainability. Microgrid storage can help smooth

the effects of intermittent power generation (e.g. from solar and wind) and increase overall grid stability." (http://schatzcenter.org/microgrids/)

These microgrids must be powered by *onsite generation* in order to minimize risk and maximize carbon reduction.

RCEA needs to focus on and dramatically expand and promote distributed solar, and abandon onshore wind power; and to stop minimizing the impacts from onshore wind and dismissing the feasibility of widespread solar.

•Fiduciary responsibility to explore, offer, and focus on the best, least impactful & least expensive energy option over time for Humboldt=Solar, it's really that simple.
•Hire a specialist to recruit the entire gamut of the solar and storage industries into our County
•Form a solar advisory committee representing all aspects instead of a poor stepchild to utility scale wind. Done right, solar can also feed the grid.
•Budget for attendance at solar technology "fairs"
•Mobilize all resources to implement widespread solar, including door-to door outreach and accelerated solar mapping
•Focus on financing options that make solar electricity available to as many as possible, especially low income people
•Convert public offices and vehicles

•A massive active effort, as if this were an emergency
•Secure, resilient energy available during grid shutdowns and emergencies
•Reduce carbon footprint, increase energy awareness
•Electrify transportation and heating
•Share our energy wealth affordable for all, rather than concentrate it
•Reduce natural gas use

4 Components

Coordination

•Ensure building codes, maximize passive solar;
•Advise and promote solar training programs and education;
•Hospitals, shelters, Critical entities, HCAOG & Coalition for Responsible Transportation Priorities (CRTP), HSU;
•Entrepreneurs in EVs, charging, and EV2Grid, and micro-grids;
•The many companies and entrepreneurs specializing in solar financing,

Demand

•Efficiency
•Widespread distributed public and private rooftop and open space solar PV

•Solar electricity production fosters energy IQ

Transportation

•Electrify public and private transportation

•Best incentive for EVs is local solar production. It's the economics, with rapid payback, and low cost fuel, forever. EVs require little maintenance, no petroleum, and last a very long time, but their maximal benefit is when charged with locally produced solar. Many choices, ranges, prices for new and used EVs on the horizon.

Energy Generation and Environment

•We have arrived at both global heating and global extinction because we have ignored the impacts of our industrial development on biodiversity. We should not succumb to the argument that climate change will kill all anyway, instead we should always choose energy options that protect biodiversity, for without biodiversity there can be no adaptation, so we must preserve what is left if we can. We must nourish our soils, forests, watersheds and vegetation that sequester carbon.

•Onshore wind divides our communities and fragments and degrades biodiversity, especially in the windiest sites, which are sacred to the local Native Americans, so utility scale onshore wind

power should be abandoned in favor of offshore. Solar brings us together. The enormous construction of onshore emits many 1000s of tons of GHGs into our 10-year emergency window, while removing carbon sequestering trees, vegetation, grasslands and soils that would have eliminated 1000s of tons of GHGs *annually*.

•Local solar has no competition, so far, for our ideal energy source. Like all products, they contain embedded energy, but the lifecycle is containable, the elements abundant and recyclable, and used or recycled unused panels are widely available for as little as $65 for 270 W, and many are free for the hauling.

•Having a grid that continues to supply electricity from increasingly networked local solar has none of the impacts of wind, hydro, nuclear, or "solar farms," and combined with local solar should define the future.

•Solar is 21 century technology that generates electricity by ionic transfers, like we do, with essentially no wasted heat. Solar is cool.
Wind turbines are based on 19 century technology, require constant surveillance and frequent maintenance to avoid potentially catastrophic accidents, and have ongoing adverse hydro-meteorological, socio-economic, biological, and psychological impacts.

•Solar just keeps getting less expensive and more rewarding over time with minimal if any adverse impacts.

•Solar requires no maintenance and minimal new infrastructure, including wildfire prone transmission lines, which lose up to 30% of transmitted electricity.

•Networked grid-tied micro-grids with EV stations provide the ultimate in secure resilience, dynamic independence from the grid, intelligent supply-demand allocation, and mobile electricity storage and supply vehicles that can travel to shelters, hospitals, and other critical facilities.

•Solar creates jobs throughout the County, whereas utility scale generation yields very few.

•Solar engenders energy awareness and reduces reliance on the grid, PGE, and ever-increasing utility bills.

•Solar electricity plus EV and battery storage can be sold to the grid, earning public and private revenues while contributing to balanced grid loads.

•Solar is exciting because we own it, it supplies our homes, our neighborhoods, our public

offices, our transportation, our bank accounts, our security, our resilience: that's what sharing our energy wealth looks and feels like.

•Solar can be installed in many very inexpensive ways by individuals, and systems can be portable.

•Clean wind energy can be purchased from the grid from established facilities where the wind patterns are well known and the impacts can actually be reduced by re-powering derelict turbines with modern ones, at ratios of 20:1. That's having "both" wind and solar. TerraGen's, and any electricity from virgin wind sites, are inherently filthy wind power (see "Wildfires and GHGs").

CAPE COMMENTS
Ken Miller
9/2019

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Wildfire, CEQA and GHG emissions related to TerraGen and any future virgin wind sites

As you plan our energy future, please consider the following with respect to developing an onshore utility scale wind industry in the face of our climate emergency:

GHG Emissions

The DEIR for TerraGen vastly underestimates the GHG emissions from its construction, ignoring those from fuel and component barging and transport, including pace cars, flaggers, other associated activities for logging, vegetation removal, waste collection and transport to landfills, subcontractors, batch plant operations, 101 bypasses, the over 300 workers' total fuel requirements, etc.

TerraGen's DEIR calculations of emissions from construction equipment employ the CalEEMod model which assumes flat terrain. They also relied on steady-state engine dynamometer results that do not represent the construction reality.

Vegetation removal, logging and 3 million cubic feet of soil disturbance eliminates *ongoing annual* carbon sequestration of as much as 3600 MTC02e per one expert, yet these climate warming contributions within our 10-year climate emergency window are ignored by TerraGen and its supporters. This is consistent with the 2-7 MTCO2e per acre per year in Arcata Community and the Van Eck forests, reflecting the fact that trees are 50% carbon.

These omissions underestimate their GHG contributions to climate warming perhaps by an order of magnitude.

The FEIR for TerraGen will act as a programmatic EIR for future wind development, and incorporate the same minimization of risk, and exaggeration of benefits, as TerraGen's.

WILDFIRES

TerraGen ignores the risk of wildfires related to oil-filled turbines and extensive transmission lines, despite California's recent history of transmission-related fires, and despite the fact that this project would be within Severe High Fire Risk areas of State Responsibility (meaning we taxpayers).

The DEIR omits any reference to the well-established downwind hydro-meteorological effects of turbine blades sweeping an area of 4.5 acres, at tip speeds of 200MPH.

Downwind turbulence and drying increase the risk of

wildfire locally for over 15 miles. On a larger scale, climate is affected:

“Extracting energy from the wind causes climatic impacts that are small compared to current projections of 21st century warming, but large compared to the effect of reducing US electricity emissions to zero with solar.”

"Wind turbines generate electricity but also alter the atmospheric flow." "Those effects redistribute heat and moisture in the atmosphere, which impacts climate.

(see “Observation-based solar and wind power capacity factors and power densities” 10/2018 by Miller & Keith; or “Local and Mesoscale Impacts of Wind Farms as Parameterized in a Mesoscale NWP Model” by Fitch et al 2/2012).

TerraGen glosses over the risk fire with no details or evaluation of risk factors, and assumes that current or minimally upgraded firefighting assets will respond adequately.

However, CEQA updates from 12/28/2018 require evaluation of “any potentially significant direct, indirect, or cumulative environmental impacts of locating development in areas susceptible to hazardous conditions,” and/or *“located in or near state responsibility areas or lands classified as very high fire hazard severity zones.”*

The HumWind is located in both.

One fire, extending anywhere between and including

Rainbow Ridge down to Scotia, Rio Dell, and Stafford, and over to nearby Humboldt Redwoods State Park, would eradicate or offset not just the benefits of $2m in taxes, which amounts to $15/per resident, but any conceivable benefit of its purported longer term carbon-free electricity production.

THE SOLAR ALTERNATIVE

If it weren't for all the terrible downsides of onshore wind in our biodiverse and sacred sites, we could have both.

RCEA should acknowledge that widespread distributed public and private rooftop and open space solar arrays, with networked minigrids coupled with EV stations, are the *best ways to satisfy all of your four areas of concern.*

We can meet our obligations to reduce our carbon use, raise our energy IQ, and contribute meaningfully and economically to intervening in our climate emergency without making it worse.

The comparative economics of onshore utility scale wind vs local solar should compel RCEA to aggressively implement the latter. In 5-10 years, with solar, we can own electricity and revenue-generating systems and enjoy secure resilience in the event of grid shutdowns and emergencies. Equity accumulates over time, hundreds of local jobs are created, and we can electrify transportation and heating. Our utility bills would plummet

With utility wind, we get to buy *their* power, suffer immediate and long-term adverse impacts, risk wildfires,

gain zero resilience, and collect minimal tax. If we want utility wind, there's plenty available, and in the 2-3 years it would require for TerraGen to produce electricity, we could have a vigorous solar program.

RCEA Directors share everyone's desire to do something now, but that does not translate solely into TerraGen. We have a better choice. RCEA would have to knock on doors, ours and solar entrepreneurs and financers, and attend solar technology conferences, rather than invite into the County double hedge-funded global powerhouses like TerraGen and their owners, Energy Capital Partners, instead.

TerraGen supplied the following cost estimates to generate 135MW from rooftop solar, which after tax credits, equals the $200m cost of TG:

"The HWP would provide 135 MW of energy at the grid. Terra-Gen cost for the project ~ $200,000,000.

135 MW = 135,000,000 watts, this translates to 473,364 MWH/year

According to PV watts, the government website it shows that Eureka gathers 1,330 kWh/year. Here we are only able to collect on average for 4.6 hours per day, or said another way, for 19% of the day are we producing full output.

That means to produce the same amount of energy that the wind farm would provide would take 409,000,000 MW of PV.

Shown another way, and this is not considering the solar strength of Eureka.

· 135 MW = 135,000,000 watts

· The average home solar system is 7,000 watts.

· That would require 19,285 homes to put solar on to compensate for the energy of the HWP.

· On average, a home solar system costs $15,000 out of pocket before tax credit.

· If 19,285 individuals made the investment to purchase solar systems, it would cost, $289,285,714.00 “

Of course, the sun shines over all of Humboldt not just Eureka.

CONCLUSION:

Thank you for your outreach.

Abandon onshore, implement widespread solar until offshore supplies the grid, without the devastating impacts of onshore, including community divisions and disrespect of local Tribes.

Respectfully submitted,

Ken Miller

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