Public Comment

March 28, 2019 Board of Directors Meeting

From:	Sheri L Woo
To:	Matthew Marshall; Lori Taketa
Subject:	Fwd: Please don't authorize expenditure for CAISO interconnection study, for offshore wind
Date:	Wednesday, March 27, 2019 11:11:57 AM

Hi, this for public comment.
Thanks, Sheri

---------- Forwarded message ---------
From: [redacted]
Date: Tue, Mar 26, 2019, 4:41 PM
Subject: Please don't authorize expenditure for CAISO interconnection study, for offshore wind
To: <efennell@co.humboldt.ca.us>, <dmiller@trinidad.ca.gov>, <sdaugherty@bluelake.ca.gov>, <aallison@ci.eureka.ca.gov>, <dglaser@ci.fortuna.ca.us>, <wilsonf@cityofriodell.ca.gov>, <woo@hbmwd.com>, Robin Smith <cityclerk@ci.ferndale.ca.us>

The RCEA agenda for this month includes Old Business

"5.1 Consider approval of expenditure of $273,500 toward the Redwood Coast Offshore Wind Project's CAISO interconnection process phase-2 financial security posting and authorize the Executive Director to execute any associated documents."

Here's why authorization would be a bad idea:

There's been no credible feasibility study of offshore wind here;
In a feasibility study, CAISO interconnection evaluation is one of the last steps, not the first;
Floating offshore wind in Europe has been quite expensive (Hywind in Scotland came in at capacity cost of $8800/kW compared with US on-shore costs of $1600/kW in 2017) with most of that difference in material cost;
Floating offshore wind trials in Europe have no long term track record;
Our harbor isn't deep enough for the equipment necessary;
Better offshore wind resources are further down the coast;
Terra-Gen's onshore wind above Ferndale is clearly more economic, and those developers know what they are doing;
If offshore wind here were a good idea we could find developers who know what they are doing to come and do a feasibility study.

I strongly support renewable energy and have worked in wind and solar since 1985, but when so many better ideas are available I do not support uneconomic ones.

This interconnection evaluation is the equivalent of paying to design a hydrogen powered train for East-West Rail.

RCEA has a wonderful track record as a retail agency helping Humboldt County residents, and I hope it will continue to do that.

Give me a call if I can clarify further,

John Schaefer
[redacted]

From:	Walter Paniak
To:	Lori Taketa
Subject:	Statement by chair of California Public Utilities Commission
Date:	Friday, March 22, 2019 6:54:27 PM
Attachments:	My turn Biomass electricity isnt cheap wont end wildfires CALmatters.pdf

The title of the attached article is : Biomass electricity isn't cheap, won't end wildfires.

Michael Picker is the chair of the California PUC. If possible please add this the agenda packet for next week.

This comment is from Walt Paniak residing in Arcata.

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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

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.

CALmatters

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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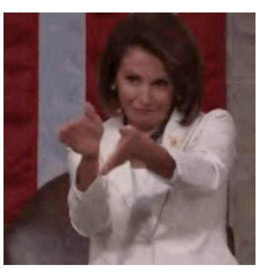

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COMMENTARY

From:	Linda Lee
To:	Lori Taketa
Subject:	Please Pass Proposed Resolution 2019-1 for 100% Clean and Renewable Energy by 2025
Date:	Wednesday, March 27, 2019 10:35:39 AM

Thank you for working on this. Time's a-wastin'...It is very important that we make this happen.
thank you,

Vaden Jantz, Manila

California Biomass and Waste-To-Energy Statistics & Data

In 2017, biomass-produced electricity in our state totaled 5,767 gigawatt-hours (GWh) or 2.8 percent of the state's total system power. A total of 93 operating biomass power plants, with an installed capacity about 1,305 megawatts, are in California.

Biomass power plant is the general term for waste-to-energy power plants that burn organic material. They are comprised of four specific types defined by the fuel they burn:

- Biomass
- Digester Gas (Anaerobic Digestion)
- Landfill Gas
- Municipal Solid Waste (MSW)

The plant pictured on the right is the Wheelabrator Shasta Energy Company power plant in Anderson, California. It uses forest "residue" that is chipped up - dead and downed trees and slash and debris from logging - as its fuel.

For an animated movie about how a waste-to-energy plant works, go to: http://wheelabratortechnologies.com/index.cfm/plants/how-it-works/

Contact: Michael Nyberg, michael.nyberg@energy.ca.gov

Photo by Warren Gretz NREL 00298

Biomass & Waste-to-Energy Electricity Production

(In Gigawatt-Hours; Includes Imports)

Go to a Different Year ▼ Go

Year	Company Name	EIA Plant ID	CEC Plant ID	Plant Name	State	Capacity (MW)	Gross MWh	Net MWh

From:	Walter Paniak
To:	Lori Taketa
Subject:	Fwd: One further question about biomass
Date:	Wednesday, March 27, 2019 4:16:55 PM

Correction 2017 data not 2007 data.
Sorry.

---------- Forwarded message ---------
From: **Walter Paniak** <[redacted]>
Date: Wed, Mar 27, 2019 at 1:52 PM
Subject: Fwd: One further question about biomass
To: Lori Taketa <ltaketa@redwoodenergy.org>

Found an error in California Energy commission report for 2007 for the Scotia power plant.
Distribute if needed.

---------- Forwarded message ---------
From: **Nyberg, Michael@Energy** [redacted]
Date: Wed, Mar 27, 2019 at 1:29 PM
Subject: RE: One further question about biomass
To: Walter Paniak [redacted]
CC: Gee, David@Energy [redacted]

Good catch Walt. Yes, it seems the power plant incorrectly reported those values. I have a call into the company to correct the ongoing reporting.

The proper values should be:

E0063 – Scotia:

2017 Gross MWh: 118,495

2017 Net MWh: 89,865

2016 Gross MWh: 125,957

2016 Net MWh: 106,263

I will update the figures on the next website update.

Thanks again,

Michael

Michael Nyberg

Supervisor, Supply Data & Analysis Unit

Energy Assessments Division

California Energy Commission

[redacted]

[redacted]

www.energy.ca.gov

From: Walter Paniak [redacted]
Sent: Wednesday, March 27, 2019 12:55 PM
To: Nyberg, Michael@Energy [redacted]
Subject: One further question about biomass

Look at plant 50049 Humboldt Redwood at Scotia. There might be a clerical error. It looks like 48 thousand MWh parasite usage. Any thoughts?

Thanks

Walt Paniak

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Walt Paniak

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Walt Paniak
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Walt Paniak

Berkeley
UNIVERSITY OF CALIFORNIA

Daniel L. Sanchez
Cooperative Extension Specialist
Department of Environmental Science, Policy, and Management

160 Mulford Hall
Berkeley, CA 94720
[redacted]
https://ourenvironment.berkeley.edu/people/daniel-sanchez

To: Board of Redwood Coast Energy Authority
Date: March 28th, 2019
From:
Daniel L. Sanchez, PhD., Cooperative Extension Specialist; Department of Environmental Science, Policy, and Management, University of California Berkeley
Yana Valachovic, University of California Cooperative Extension County Director and Forest Advisor; Humboldt and Del Norte Counties

Dear RCEA Board,

As Specialists and Advisors with University of California Cooperative Extension, we wish to highlight the importance of using local biomass[1] as a clean energy source and applaud Redwood Coast Energy Authority (RCEA) utilization of biomass in meeting your renewable portfolio. We appreciate RCEA's efforts to procure a power mix that produces benefits for our local community, economy, and the environment.

Our support for bioenergy production in Humboldt County arises from its numerous benefits: clean energy, improved forest health, ambitious climate change mitigation, and rural job creation. We recognize that no energy source is perfect, but on the balance, locally produced and utilized biomass provides numerous public trust, environmental, and economic benefits. Below, we summarize the unique role that biomass plays in helping RCEA achieve these goals and respond to some of the questions and concerns that were documented in the February RCEA monthly board minutes. More information about the benefits of woody biomass and bioenergy is included in an appendix to this letter.

Clean energy

There is no universally accepted definition of clean energy. Definitions can incorporate life cycle analysis, social justice, and other externalities. Nevertheless, the vast majority of scientists and governments classify biomass as both a clean energy and renewable (i.e. non-fossil fuel) source. The State of California considers solar, wind, geothermal, biomass, small hydro, renewable methane, ocean wave, ocean thermal, or fuel cells as renewable fuels[2].

We assert that when bioenergy is made from locally grown trees and shrubs it is a clean energy source. Not only do trees convert solar energy into fixed carbon, they store energy organically with far lower environmental impact than fossil fuels. This naturally fixed carbon and energy may then be managed as habitat in the forest, harvested for use as a building material, or utilized as energy in a biomass plant. Burning

[1] The term "biomass" most simply defined is the organic matter in trees, agricultural crops, and other living plant materials "Woody biomass" refers to trees, shrubs, bushes, or products derived from these woody plants that accumulate to an amount that is a hazard or disposal problem. Woody biomass can be used for heat, bioenergy, and forest or agricultural products.

[2] https://focus.senate.ca.gov/sb100/faqs

biomass through bioenergy production is importantly distinguished from burning fossil fuels in that biomass is part of the actively cycled carbon in the atmosphere and was sequestered within the past 40-100 years, while fossil fuels reintroduce carbon into the atmosphere sequestered 60-200 million years ago and removed from the carbon cycle.

We believe that all clean energy sources have an important role to play in fighting climate change and producing renewable energy. In this regard, biomass provides many advantages, especially when it is utilized from the local area. From producing long-lived building materials that sequester carbon, to generating renewable heating, cooling, and energy in local communities, smart biomass utilization can support the interrelated goals of forest health, forest carbon sequestration, water and air quality, creating and maintaining jobs, as well as keeping forests healthy for everyone's enjoyment and recreation.

Additionally, the 2019 Green New Deal supports mobilization of a wide-range of clean energy technologies, including biomass. The Green New Deal sets a goal of "meeting 100 percent of the power demand in the United States through clean, renewable, and zero-emission energy sources." RCEA has already shown to be a leader in how to implement this vision in an economically and socially sustainable way.

Forest health

The fire seasons of 2017 and 2018 in California[3] have been a reality check for many, forcing a collective understanding that the fire problem is not just about fire. In California alone, at least 129 million trees have died since 2010, due to a combination of fire suppression leading to overstocked and dense forests[4], drought, and pests. Managing the large number of dead trees is a difficult challenge, particularly within the context of protecting rural California residents. As a result of the recognition of these multifaceted challenges, in January 2019 the Governor charged CAL FIRE and the Resources Agency with the task of reducing fuels to protect our most vulnerable communities. CAL FIRE estimates that 15 million acres need forest restoration[5] and recognizes that "while it is not possible to eliminate wildfire risks in California; focused and deliberate action can protect communities and improve forest and fuels conditions to enable a more moderate and healthier wildfire cycle that can coexist with Californians". These challenges are not limited to the Sierra Nevada and are common throughout California including the North Coast.

The North Coast is blessed and burdened with highly productive forest and plant growth. However, all living vegetation is part of the carbon cycle and its fate is eventual carbon release either through decomposition or wildfire. The question is when and how? Management of this growth in the form of forest fuels reduction and the reduction of stand densities are important steps to creating fire resilient forests and reducing uncontrolled emissions of greenhouse forcing gasses and black carbon during wildfires. Over the coming decade California will see an enhanced level of fuel reduction through mechanical and prescribed fire techniques and a broader level of incentives to manage fuel backlogs and improve forest health. Bioenergy utilization with emission-

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[3] Governor's Executive Order N-05-19 https://www.gov.ca.gov/wp-content/uploads/2019/01/1.8.19-EO-N-05-19.pdf and the state emergency declaration http://www.fire.ca.gov/general/downloads/45-DayReportPlans/3.22.19-Wildfire-State-of-Emergency.pdf

[4] Parsons and DeBenittie (1979) Impact of fire suppression on a mixed-conifer forest. Forest Ecology and Management 2: 21–33.

[5] CAL FIRE 45 Day Report. http://www.fire.ca.gov/downloads/45-Day%20Report-FINAL.pdf

controlled technologies is an important part of the solution and provides an alternative to open-pile burning[6] of forest fuels and prescribed fire.

Ambitious climate change mitigation
Biomass utilization produces important carbon sequestration benefits, which can help support California's ambitious climate change mitigation goals. In particular, Executive Order B-55-18 To Achieve Carbon Neutrality, issued by Governor Brown on September 10, 2018, places California on a path to net-neutral economywide emissions by 2045[7]. Carbon sequestration from biomass will be essential to achieving this goal, as carbon stored in living trees or wood-based lumber products can help to offset emissions from hard-to-decarbonize sectors such as aviation, long-distance trucking, and agriculture. Further, biomass supports removal of forest fuels that are otherwise placing these carbon stores at risk.

Furthermore, biomass has an important role to play in carbon sequestration. In the near-term, maintenance of bioenergy markets will help reduce forest fuels thereby helping California's forests become more resilient to wildfire or other disturbances. In the future, RCEA and other energy consumers may be able to procure net carbon-negative electricity from biomass, which permanently removes CO_2 from the atmosphere. For instance, numerous scientists and policymakers recognize that biomass utilization combined with carbon sequestration (commonly referred to as BECCS—Bio-Energy with Carbon Capture and Storage) will be necessary if we are to keep global warming significantly below 2 degrees Celsius. Supporting biomass energy through power purchase agreements and other procurement mechanisms can help drive the deployment of BECCS technologies in California as they become commercially viable.

Finally, many recognize that a "portfolio" approach to fighting climate change produces large economic benefits in comparison to those that rely solely on a limited number of energy sources[8,9]. Biomass, alongside other renewable energy sources, can play an important role in achieving cost-effective climate change mitigation.

Rural job creation
Biomass creates economic opportunities locally. Forest management and restoration activities cannot be outsourced and produce many living wage jobs in our local communities. These jobs include forest management, forest operations, trucking, processing, and other value-added operations. The many steps involved in bioenergy production require that workers be employed to operate each link of the supply chain.

Smart biomass utilization will help protect and enhance forest health while creating economic opportunities. We urge RCEA to sustain their commitments to bioenergy produced electricity and to Humboldt County for both the near-term and long-term benefits.

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6 Springsteen B, Christofk T, York R, Mason T, Baker S, Lincoln E, Hartsough B, Yoshioka T. 2015. Forest biomass diversion in the Sierra Nevada: Energy, economics and emissions. Calif Agr 69(3):142-149. https://doi.org/10.3733/ca.v069n03p142 http://calag.ucanr.edu/Archive/?article=ca.v069n03p142

7 https://www.gov.ca.gov/wp-content/uploads/2018/09/9.10.18-Executive-Order.pdf

8 D.L. Sanchez, J.H. Nelson, J. Johnston, A. Mileva, D. Kammen. "Biomass enables the transition to a carbon-negative power system across western North America." *Nature Climate Change*, 5, 230–234 (2015).

9 S.J. Davis *et al.* (with over 30 authors) "Net-zero emissions energy systems" *Science* (2018). http://science.sciencemag.org/node/711939.full

Sincerely,

Daniel L Sanchez, Ph.D.

Yana Valachovic, RPF #2740

Appendix: FAQs about Biomass in California's North Coast

What is biomass?

The term "biomass" most simply defined is the organic matter in trees, agricultural crops, and other living plant materials. "Woody biomass" refers to trees, shrubs, bushes, or products derived from these woody plants that accumulate to an amount that is a hazard or disposal problem. woody biomass materials can be used for heat, energy, and forest or agricultural products. Woody biomass contrasts with higher value, and typically larger diameter "saw logs" used to produce lumber, panels, veneers, or poles.

Before and after photos of a forest restoration project in Humboldt County.

In Humboldt, forests provide sources of biomass feedstocks used for bioenergy production. Urban wood waste or agricultural products (e.g. fruit tree prunings, pits or shells) are not used as feedstocks. Currently the largest consumers of low commercial value woody biomass in California are bioenergy power plants.

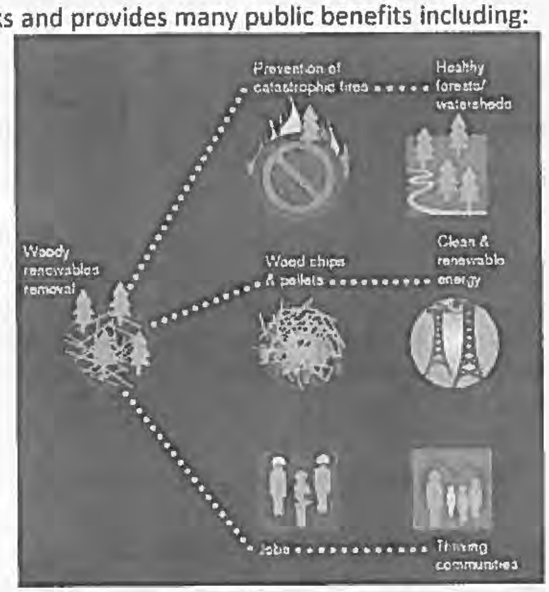
Why is woody biomass the largest local source of power?

Humboldt County has some of the world's most productive forest lands. Forest byproducts are an important locally available resource. Materials, created from thinning forests and the chips and bark produced in sawmills, can be utilized in an emission-controlled power plant to produce energy. In the 1980s Humboldt County's biomass power plants were created to utilize a local resource and to replace tee-pee burners where wood chips had been burned without pollution control technologies.

What are the benefits of using woody biomass?

Woody biomass provides an important source of bioenergy feedstocks and provides many public benefits including:

- ✓ **Delivering flexible or baseload generation.** Woody biomass energy production provides a continuous (24-hour), reliable supply of power, unlike variable renewable energy sources like solar or wind.
- ✓ **Promoting healthy forests and defensible communities.** Woody biomass can be sourced from existing forest management activities, particularly fuels reduction prescriptions, that target diseased, bark beetle-killed, and/or over-crowded forests that contribute to historically uncharacteristic catastrophic wildfires.
- ✓ **Reducing emissions from wildfires** or burn piles. Bioenergy facilities are equipped with modern air quality emission technologies. Woody biomass emissions are far-lower than wood stoves and substantially lower than burn piles or wildfires (currently, the fate of most woody biomass due to facility closures throughout California).



Graphic courtesy of the Sierra Institute for Community and the Environment

- ✓ **Reducing greenhouse gas emissions**. Bioenergy production that uses materials from sustainably managed forests reduces long-term climate impacts by replacing fossil fuels.
- ✓ **Utilizing a local product.** The ability for forest landowners to sell otherwise non-merchantable woody materials provides an economic incentive to steward and conserve local forests. Many powerplants also utilize wood chips and sawdust providing and additional economic return to landowners.
- ✓ **It's renewable.** Unlike coal, oil, and natural gas, which are fossil fuels that bring "new" carbon into the earth's atmosphere, woody biomass is an abundant and renewable source of fuel. The burning of woody biomass and the growth of trees creates a closed-loop system and does not contribute additional carbon. Furthermore, woody biomass operations turn wood waste into electricity without compromising the essential cultural and habitat values that forests provide.


Historic "teepee" burner of wood waste, Carlotta, CA

What infrastructure does biomass support?

Functioning forest bioenergy infrastructure supports restoration and the local economy. Regardless of the forest management goal (e.g. restoration, economic return, fuels reduction, etc.) our region needs skilled laborers, the means for transportation, and the processing and disposal of cut materials in the forest and from the byproducts of milling. If Humboldt County's bioenergy facilities were to close, any forest restoration project would be significantly hindered. The forest products industry and the bioenergy power plants provide many living wage jobs, producing about 4-5 jobs per MW.

Why build with wood?

Building with wood is part of our future climate change solution. Not only does the North Coast produce wood; wood has superior climate benefits over concrete and steel constructed building materials. As trees grow they convert CO_2 into stored carbohydrates. When this carbon is utilized in buildings it provides long-term carbon storage. By contrast, the production of concrete and steel require significant energy input and during the process carbon from fossil fuels are released into the atmosphere. In 2010 the building sector was responsible for 45% of the US CO_2 emissions; better utilizing wood will help reverse these emissions. The production of long-lived lumber building materials from wood, such as cross-laminated timber, provides immediate and long-lasting carbon sequestration, as well as creating important markets for domestic forestry products.


Bioenergy facilities purchase chips, bark, and sawdust from sawmills. In Humboldt County more than 100 truckloads of chips are produced a day (or 2500 tons).

What are the challenges to using biomass?

There are many challenges for using woody biomass based on unfavorable economics. Although there is a long list of products that could be produced from woody biomass, there are often competing raw materials to make these products at lower cost. Policymakers can provide more opportunities for woody biomass by encouraging their use in efficient energy conversion facilities, using small diameter trees in their round form instead of trying to produce lumber, supporting the research and development needed to encourage investment in higher value fiber uses for composite materials (such as composite panels and wood fiber/plastic products), and continuing the search for cost-effective chemical processing to biofuels and other organic chemicals.

Is biomass considered clean energy?

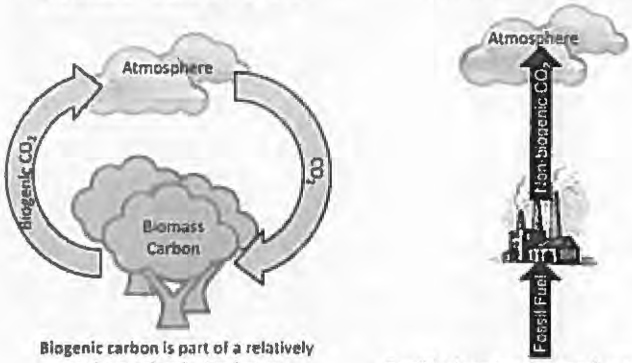
Yes, by most, biomass is "clean". While there is no universally accepted definition of clean energy, most definitions of clean typically encompass renewable energy (i.e. non-fossil fuel) sources alongside sources that produce no new CO_2 emissions. The State of California typically defines renewable energy resources as including solar, wind, geothermal, biomass, small hydro, renewable methane, ocean wave or thermal, or fuel cells using renewable fuels. Moreover, nearly every state that has a Renewable Portfolio Standard policy includes biomass as an eligible source[10].

Most agree that a "portfolio" approach to fighting climate change produces large economic benefits in comparison to those that rely solely on a limited number of renewable energy sources. Biomass, alongside other renewable energy sources, can play an important role in achieving cost-effective climate change mitigation.

What are the state's policy goals relating to biomass?

Biomass benefits from a multitude of policy incentives in the State of California, including its renewable portfolio standard, tax incentives, supportive regulatory policies, and State-sponsored research.

The "neutral" biomass carbon cycle *vs* **Carbon transfers from geological reserves**



Biogenic carbon is part of a relatively rapid natural cycle that impacts atmospheric CO_2 only if the cycle is out of balance

Fossil fuel combustion transfers geologic carbon into the atmosphere. It is a one-way process

California has many policies that address carbon sequestration, which uniquely advantages biomass. Biomass utilization produces important carbon sequestration benefits, which can help support California's ambitious climate change mitigation goals. Of note, Executive Order B-55-18 To Achieve Carbon Neutrality, issued by Governor Brown on September 10, 2018, places California on a path to net-neutral economy emissions by 2045. Storage of carbon in forests, wood, and other long-lived products will be essential to achieving this goal.
Other strategies include forest carbon offset markets encourage longer-term storage of carbon in living tissue by requiring maintenance of elevated stocking levels and older tree ages. Biomass utilization strategies are focused on capturing the energy stored in fixed carbon and using it to replace energy sourced from fossil fuels. Bioenergy generation is a way to capture energy and carbon that would otherwise be lost to the atmosphere in wildfires (in the case of forest thinning residue) or decomposition (in the case of mill waste).

Numerous opportunities for biomass emerge when examining carbon sequestration. The production of long-lived lumber building materials from wood, such as cross-laminated timber, provides immediate and long-lasting carbon sequestration, as well as creating important markets for domestic forestry products. Carbon sequestration from biomass can extend into the energy sector. A recently released report by the Intergovernmental Panel on Climate Change, Global Warming of 1.5°, recognizes that biomass utilization combined with carbon sequestration (commonly referred to as BECCS—Bio-Energy with Carbon Capture and Storage) will be necessary if we are to keep global warming significantly below 2 degrees Celsius. Supporting biomass energy can help drive the deployment of BECCS technologies in California as they become commercially viable.

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[10] https://www.c2es.org/document/renewable-and-alternate-energy-portfolio-standards/

Humboldt Redwood™

March 28, 2019

Redwood Coast Energy Authority
633 3rd Street
Eureka, CA 95501

Re: Resolution # 2019-1

Dear RCEA Board,

It has come to our attention the RCEA Board is considering a 2025 goal of achieving 100% clean and renewable energy. Part of this process will also define "clean" and "renewable". While the board goes through this process we urge the board to continue to include biomass facilities as a clean and renewable source of energy.

The biomass industry in Humboldt County and the state for that matter is about managing waste streams. No one in California harvests trees for a biomass facility. It is the waste from the milling and log processing processes that makes biomass facilities critical to using this material in a beneficial matter. If we find ourselves in a situation where we cannot contract for the sale of biomass energy, we will have to find another home for this waste. There are three options at this point and all of them will have significantly more impact on air and other environmental resources.

The first option is to transport the waste to a landfill. The state has goals to increase landfill diversions to other uses so obviously this will be counter to these goals. The second option is to truck the waste to another biomass facility, likely in the Redding area. This will create diesel exhaust that could be avoided if the waste was used locally. The third option, and the one most likely to be used if a use for the waste is not available, is to pile and burn. This has been shown to drastically increase emissions in particulate matter, carbon monoxide, and other greenhouse gases.

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 energy, air quality and GHG benefits from biomass facilities versus open pile burning. They found 98% to 99% reductions in emissions of particulate matter, carbon monoxide, nonmethane organic compounds, and black carbon when comparing biomass facilities to open pile burning (see attached study, page 6).

The waste from our facility in Scotia comes from trees harvested in Humboldt County under the most stringent forest practice rules in the nation and likely the world. The logs coming from our forestlands are additionally certified by the Forest Stewardship Council as coming from a well managed, sustainable forest. A significant number of landowners who sell logs to us are also FSC certified.

Post Office Box 390, Calpella, California 95418 allweatherwood.com, getredwood.com

Humboldt Redwood

It is for these reasons we urge the RCEA Board to include biomass energy as clean and renewable. Not including biomass energy will move this waste stream towards one of the options discussed above and increase emissions.

Sincerely,

John Andersen
Director, Forest Policy
Humboldt Redwood Company
[redacted]

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

As an alternative to open pile burning, use of forest wastes from fuel hazard reduction projects at Blodgett Forest Research Station for electricity production was shown to produce energy and emission benefits: energy (diesel fuel) expended for processing and transport was 2.5% of the biomass fuel (energy equivalent); based on measurements from a large pile burn, air emissions reductions were 98%–99% for $PM_{2.5}$, CO (carbon monoxide), NMOC (nonmethane organic compounds), CH_4 (methane) and BC (black carbon), and 20% for NOx and CO_2-equivalent greenhouse gases. Due to transport challenges and delays, delivered cost was \$70 per bone dry ton (BDT) — comprised of collection and processing (\$34/BDT) and transport (\$36/BDT) for 79 miles one way — which exceeded the biomass plant gate price of \$45/BDT. Under typical conditions, the break-even haul distance would be approximately 30 miles one way, with a collection and processing cost of \$30/BDT and a transport cost of \$16/BDT. Revenue generated from monetization of the reductions in air emissions has the potential to make forest fuel reduction projects more economically viable.

Large regions of Sierra Nevada mixed conifer forests are in need of hazardous fuels reduction treatments to reduce the risk of high severity wildfire and return forests to fire-resilient conditions. Whether as a complement or replacement to prescribed burning, it is highly desirable to increase the pace and scale of these treatments (North 2012; North et al. 2012). Significant quantities of woody biomass wastes are the unavoidable byproduct of these treatments.

Online: http://californiaagriculture.ucanr.edu/landingpage.cfm?article=ca.v069n03p142&fulltext=yes
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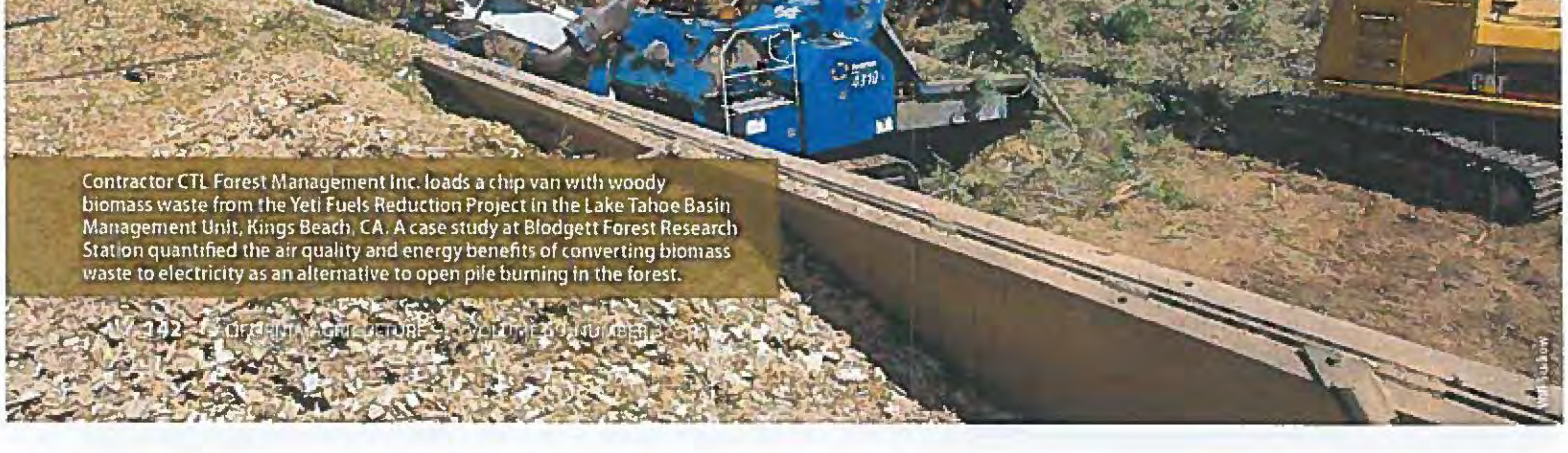
Open pile burning in the forest is most commonly used to dispose of woody biomass waste, as fire hazard reduction objectives prevent leaving the material in-field to decompose, and because in many cases it is the most economically viable option. While woody biomass wastes represent a significant renewable energy resource, the cost to process and transport the material for use as fuel to produce electricity (or use for other value-added bioproducts such as biochar, biofuels, polymer precursors or thermal energy) often well-exceeds the combined value at the biomass electricity generation plant, the avoided cost to pile burn, and the potential value of nutrients returned to the soil (which is low due to the localized and limited pile burn location). A significant drawback of open pile burning is that it generates emissions of criteria air pollutants (particulate matter, carbon monoxide, volatile organic compounds and nitrogen oxides), greenhouse gases (GHGs) and air toxics such as polycyclic aromatic hydrocarbons and aldehydes.

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 energy, air quality and GHG benefits, as well as the economics, of utilizing woody biomass



Contractor CTL Forest Management Inc. loads a chip van with woody biomass waste from the Yeti Fuels Reduction Project in the Lake Tahoe Basin Management Unit, Kings Beach, CA. A case study at Blodgett Forest Research Station quantified the air quality and energy benefits of converting biomass waste to electricity as an alternative to open pile burning in the forest.

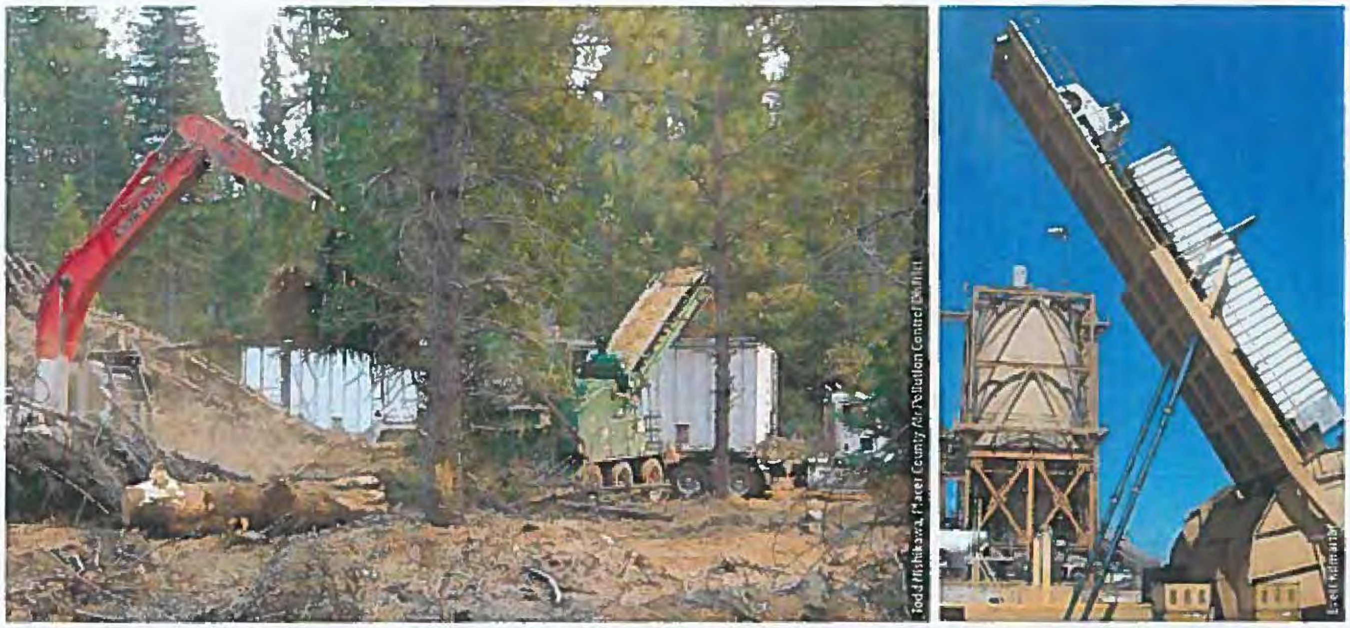


Fig. 1. At Blodgett Forest Research Station, an excavator (left) loads forest slash into a horizontal grinder. Wood chips from the grinder are then conveyed into chip vans (center) for transport to Buena Vista Biomass Power plant (right).

wastes generated at Blodgett Forest Research Station (BFRS) for renewable energy at the Buena Vista Biomass Power (BVBP) facility as an alternative to the status quo of open pile burning.

Turning a waste into a resource

The UC Berkeley Center for Forestry manages BFRS, located east of Georgetown, California. Our research project targeted woody biomass waste piles (slash) from hazardous fuels reduction and timber operations at BFRS that included tree tops, limbs and small trees. The piles were generated from thinning treatments in mixed conifer plantations during the summer of 2012. The treatment objectives were to reduce fire hazard, increase average tree vigor and increase species diversity. Operations were typical of those in the Sierra Nevada, where young and dense forests have developed following wildfires or even-aged harvests. Plantations were thinned to an average of 110 trees per acre from pre-treatment stocking levels of 222 trees per acre. Four plantations were thinned, covering a total of approximately 80 acres. Because smaller trees were preferred for removal, average stem diameter (for residual trees) at breast height (DBH) increased from 11.9 to 13.1 inches. Sawlogs greater than 6 inches diameter on the small end and at least 10 feet long were transported to a sawmill for processing into lumber products. Unmerchantable trees (too small to process into sawlogs) plus the limbs and tops of merchantable trees were piled at roadside landings for disposal by open burning. The overall size of the piles generated were typical of thinning operations in young and mature forests, with bulk volume averaging 63,000 ft^3 per pile.

A forest biomass processing contractor, Brushbusters Inc., was retained to process and transport six woody biomass waste piles for use as fuel in the BVBP generation facility located near Ione, California. BVBP is the nearest biomass plant to BFRS. At each BFRS slash pile, an excavator was used to transfer the waste material into a horizontal grinder (fig. 1). Wood chips from the grinder were conveyed directly into chip vans, and transported to the BVBP facility, typically a 65-mile one-way trip. Due to road construction projects and detours, the actual one-way distance averaged about 79 miles. Equipment used for the chipping and transport operations (detailed in table 1) were sized for scale of operations that a medium or large landowner might consider — projects for which landing piles contain at least 100 green tons (GT) of biomass wastes (the equivalent of four chip vans each holding 25 GT). All biomass received at BVBP had been chipped prior to transport.

Brushbusters' operations (grinder, loader and chip vans) were carefully observed and tracked by our team, including total operating hours, productive operating hours (time when grinding and not including time when idling or waiting), diesel fuel use, biomass production and miles traveled. Engine and equipment air emission factors used to determine processing and transport emissions were taken from the manufacturer for each particular model. The following equipment cost factors were used, based on current contractor bid rates: grinder: $450/hour; excavator: $175/hour; chip van: $90/hour.

TABLE 1. Equipment and engines for biomass processing and transport

Equipment	Vendor, model, year	Engine model, horsepower
Horizontal grinder	Bandit Beast, model 3680, 2008	Caterpillar C18, Tier III, 522 kW
Excavator	Link-Belt, model 290, 2003	Isuzu CC-6BG1TC, 132 kW
Chip van	Kenworth, 1997	Cummins N14, 324 kW
Chip van	Kenworth, 2006	Caterpillar C13, 298 kW

The BVBP facility uses a wood-fired boiler that produces steam for a turbine and generator rated for 18 megawatts (MW) of electricity. The boiler is a Combustion Engineering/Lurgi circulating fluidized bed design fueled by biomass wastes including agricultural wastes (nut shells and orchard removals and prunings), forest slash and urban wood waste (tree trimmings and sorted construction debris). The boiler utilizes selective non-catalytic reduction for nitrogen oxides control, and multiclones and a baghouse for particulate matter control.

Fig. 2. To sample air emissions from the pile burn, researchers used a 20-foot steel probe at the edge of the pile (top); nitrogen oxides, black carbon and carbon dioxide were measured on site using continuous emissions monitors. Canister samples were collected and sent for offsite analysis for total fine particulate matter, trace hydrocarbons and carbon monoxide.

TABLE 2. Forest slash composition

	Moisture	Carbon	Nitrogen	Ash	Higher heating value
	wet wt %	*dry wt %*	*dry wt %*	*dry wt %*	*Btu/dry lb*
Chips	9.4	52.5	0.14	1.3	8,359
Wood	17.7	48.8	0.58		
Needles	15.3	51.3	1.29		
Branches 1"–3"	8.8	50.2	0.46		
Branches > 3"	17	50	0.48		

BVBP energy production and air emissions from the use of the BFRS forest slash were determined from direct measurements of biomass use and heat content, boiler continuous emissions monitors, air pollution source test (Avogadro 2013) and boiler heat rate. Emissions from electricity displaced by the biomass project were determined from overall California state generation factors (CARB 2010).

Staff from the USFS Rocky Mountain Research Station Missoula Fire Lab conducted field measurements characterizing air pollutant emissions from an open burn of one of the forest slash residue piles at BFRS (for details see Baker et al. 2014). Air emissions from pile combustion were sampled through a 20-foot steel probe angled over the edge of the pile (fig. 2). Real-time continuous nitrogen oxide (NOx) (Thermo Model 42i analyzer), black carbon (BC) (microAeth Model AE51 aethelometer) and carbon dioxide (CO_2) (LICOR LI-820) measurements were conducted on site. Particulate matter less than 2.5 microns ($PM_{2.5}$) was collected on 37-mm Teflon filters at 15-minute intervals. Emissions samples were collected in SUMMA canisters — three during the flaming phase, and 31 at 10-minute intervals during the burn down — and analyzed for carbon monoxide (CO), non-methane organic compounds (NMOC), methane (CH_4) and CO_2 at the Missoula lab using gas chromatography and flame ionization detection. Pile material samples were analyzed at Missoula for moisture, carbon and nitrogen content; Hazen Research Laboratory (Golden, CO) performed ultimate analysis on a representative chip sample. Emission factors were determined using the carbon mass balance method (Hao 1996) for both a "fire average" integrated over the full duration of the flaming and smoldering phase, and a smoldering-only phase.

During the period of August 20, 2013, through September 4, 2013, on eight separate work days, Brushbusters collected, processed and transported 601 bone dry tons (BDT) (928 GT) of forest slash from BFRS to BVBP. This comprised a total of 37 separate chip van loads, with deliveries averaging 16.3 BDT (25.1 GT).

Table 2 shows forest slash biomass waste pile composition — material was relatively dry (9% to 18% moisture) with ash (1.3% dry weight) and heat content (high heating value of 8,359 Btu/dry lb) comparable to virgin conifer slash, indicating minimal contamination with rock and soil.

Energy tradeoffs

Energy use input requirements and output production for the biomass project are shown in table 3. The energy of the diesel fuel used in collection, grinding and transport is only 2.5% of the available energy of the biomass wastes delivered to BVBP; and 4.6% of the energy of the natural gas (that would be required for producing an equivalent amount of electricity in a combined cycle natural gas–fired generation facility) that is displaced by the BFRS-BVBP bioenergy project. This is consistent with displaced generation found in other studies (e.g., Jones et al. 2010; Pan et al. 2008; Springsteen et al. 2011).

Challenging economics

Biomass project economics are shown in table 4. The total delivered cost of $70/BDT was almost equally split between collection and processing at $34/BDT and transporting to BVBP at $36/BDT.

Production rates were less than expected due to lack of full-time availability of chip vans to the grinder landings. This was due to the following considerations: (1) BVBP was not in commercial operation and curtailed the hours they were accepting fuel deliveries. In many cases, trucks had to be parked loaded overnight rather than complete a one-day round trip; (2) public road contruction activities caused transport delays, resulting in average chip van transport speeds of only 31 mph; and (3) trees and brush from BFRS spur roads and landings needed to be cleared to allow van access.

Three to four chip vans were used each day for hauling. Each chip van averaged only 1.25 delivered loads per day rather than the potential two loads per day for the round-trip distance of 158 miles.

Time-motion evaluation found the grinder to be actively processing material for only 2.5 hours/day, while the grinder engine and excavator actually operated 3.8 and 4.8 hours/day, respectively (including idling and non-processing time). The biomass piles were originally created with pile burning as the planned disposal method, not grinding and removal for use as energy. The low density piles slowed feeding of the biomass wastes into the grinder. There were other delays due to moving equipment, preparing roads to access the piles and waiting for chip vans. All of these are common challenges that should be expected when first introducing biomass operations on forestlands. With improved pile stacking and a reduction in grinder idling, projected processing costs could be reduced to about $30/BDT (table 5).

Project expenditures for processing and transport were close to $70/BDT, while the competitive market value at the time of the project for biomass sourced from timber harvest residual in the central Sierra Nevada region was $45/BDT. The economic cost to dispose of the biomass wastes at the site of generation through open pile burning was less than $5/BDT. Thus, the demonstration project operated with a cost deficit of approximately $20/BDT.

Transport costs are a significant cost driver when collecting, processing and transporting forest biomass. To achieve a market price of $45/BDT for biomass fuel, the projected break-even transport distance would need to average approximately 30 miles one way. As shown in table 5, this estimate assumes

TABLE 3. Energy accounting for BFRS-BVBP bioenergy project

Operation/energy type	Basis	Energy
		Btu/lb dry biomass
Expenditures		
Grinding		
Grinder	411.6 gal diesel* (0.44 gal/wet ton biomass)	47
Excavator	204.2 gal diesel (0.22 gal/wet ton biomass)	23
Water truck	42 gal diesel	5
Transport	1,177 gal diesel (5 miles/gal)	134
Total		209
Production		
Biomass energy content	Hazen lab analysis, high heating value	8,359
BVBP biomass facility electricity	Boiler heat rate: 13,265 $Btu_{heatinput}/kWh_e$	2,134
Avoided/displaced		
Natural gas combined cycle (NGCC)	NGCC heat rate: 7,200 $Btu_{heatinput}/kWh_e$	4,503

* Diesel energy content (higher heating value): 137,000 Btu/gal.

TABLE 4. Economics of biomass processing and transport for BFRS-BVBP project

Equipment	Unit operation cost	Average operating time	Production rate	Total cost
	$/operating hour	*hours/day*	*BDT/machine-day*	*$/BDT*
Grinder (Bandit Beast)	450	3.8	75.1	22.8
Excavator (Link-Belt 290)	175	4.8	75.1	11.2
Chip van	90	8	20.3	35.5
Total				69.4

TABLE 5. Projected economics of biomass processing and transport for 30-mile one-way haul distance

Equipment	Unit operation cost	Average operating time	Production rate	Total cost
	$/operating hour	*hours/day*	*BDT/machine-day*	*$/BDT*
Grinder	400	5	95.0	21.1
Excavator	160	5	95.0	8.4
Chip van (30 miles one way)	85	9	48.9	15.6
Total				45.1

improvements in grinder processing efficiency and transport costs of $15.60/BDT (based on a chip van capacity of 16.3 BDT per load, chip van speed of 30 miles/hour, round trip of 60 miles, van loading and unloading time of 1 hour, and hourly van rate of $85/hour).

Emissions from open pile burning

On the morning of January 20, 2014, one pile at BFRS, roughly 80 feet by 100 feet wide and 15 feet tall, containing approximately 300 BDT, was burned. The pile material composition, size and stacking arrangement was similar to those moved to BVBP. The pile was lit at the edge near the steel sampling probe. Within 5 minutes, a strong convective column with 100-foot-high flames formed. Due to the size and height of the burn it was not possible to sample the main section of the plume during the full flaming combustion mode of the burn. Figure 3 shows the pile as the ignition progressed through flaming and smoldering stages. Flaming phase transitioned to smoldering phase approximately 40 minutes after ignition.

CO is a strong surrogate indicator for other products of incomplete combustion (NMOC and CH_4), as shown in fig. 4 (canister measurements taken throughout the pile burn). Because monitoring CO is comparatively straightforward, it is important to establish its relationship to compounds that are more difficult to monitor (including NMOC and CH_4). The pile burn overall modified combustion efficiency (MCE) value of 94% (table 6) is consistent with the observation of good pile burning conditions — dry material, good air mixing and high burn temperature.

Fig. 3. In 2014, researchers measured air emissions from an open pile burn at BFRS. Due to the size and height of the burn, they were unable to sample the main section of the plume during the full flaming combustion mode (see time interval at 13 minutes). Flaming phase transitioned to smoldering phase approximately 40 minutes after ignition.

Emission factors from the open pile burn at BFRS are shown in table 6, including measurement variability (standard deviation) for both the smoldering phase and the total overall integrated (flaming and smoldering phases) burn. Due to the researchers' inability to sample the primary pile smoke plume, BC results are only presented for the smoldering phase; total overall burn results are reported for the other air pollutants but may not adequately represent the flaming conditions in the main pile burn exhaust plume.

Emissions factors for $PM_{2.5}$, CO and CH_4 were consistent with those reported in the literature (see Springsteen et al. (2011) for a recent compilation of forest residue open pile burn emission factors). Emission factors for NOx and NMOC were 50% to 75% and 0% to 75% lower, respectively, than other studies. The lower NOx may be the result of the large pile size and inability to sample the high temperature locations of the pile plume during the flaming phase. As expected, emission factors for products of incomplete combustion, including CO, NMOC and CH_4, were significantly higher for the smoldering phase.

Emissions comparison. Criteria air pollutant and GHG emissions (per BDT of woody biomass) from BFRS open pile burning and the BVBP biomass energy project alternative are compared in figs. 5 and 6, respectively. GHG emissions are shown as CO_2-equivalent based on Global Warming Potential factors from the Intergovernmental Panel on Climate Change (IPCC 2013). Details of the emission factors used and calculations are in tables 7 and 8.

Reductions of $PM_{2.5}$, CO, NMOC and BC were from 98% to 99%, which is consistent with other findings (Jones et al. 2010; Lee et al. 2010; Springsteen et al. 2011). These results are due to the efficient combustion and controls at the biomass energy facility and engines used for processing and transport. NOx emissions reductions of only 17% result from the lower-than-typical NOx measured from the open pile burn.

GHG CO_2-equivalent reductions of 0.5 tons/BDT of biomass from the BVBP bioenergy project result from reduction in BC, CO, NMOC and CH_4 compared to the pile burn; and renewable electricity that displaces fossil fuels required for equivalent power generation.

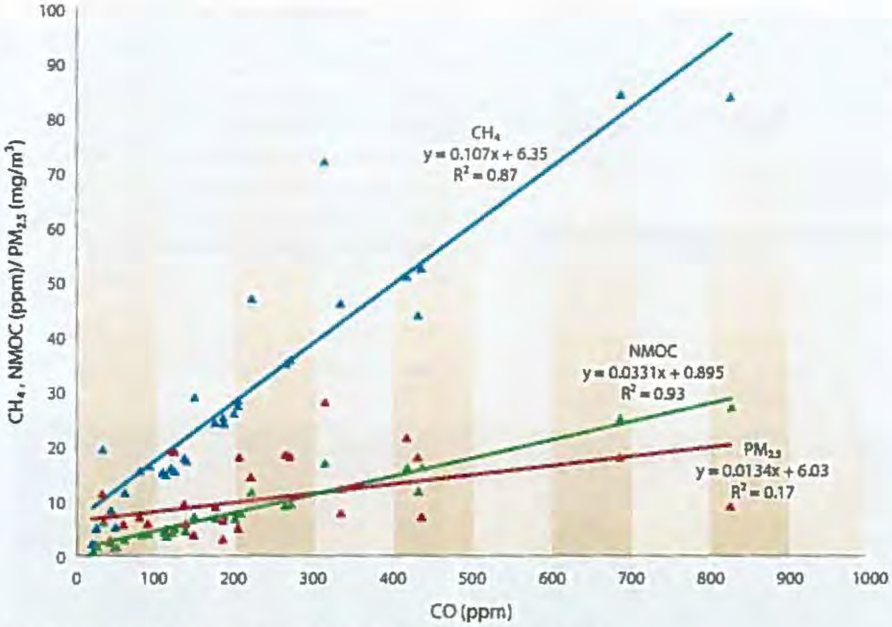


Fig. 4. Relationship between CO and NMOC and CH_4 for open pile burn.

TABLE 6. Open pile burn emission factors (g/dry kg forest slash)

	Total (flaming and smoldering)		Smoldering	
	Average	Standard deviation	Average	Standard deviation
CO_2	1,708.0	89.6	1,511.0	56.7
CO	66.3	45.8	157.6	33.2
CH_4	5.00	4.60	13.50	3.50
NMOC	1.48	2.66	7.39	1.68
NO	0.94	0.41		
NOx	1.03	0.41		
$PM_{2.5}$	5.27	5.31	5.31	5.92
BC			0.32	
MCE (%)	94	4	86	3

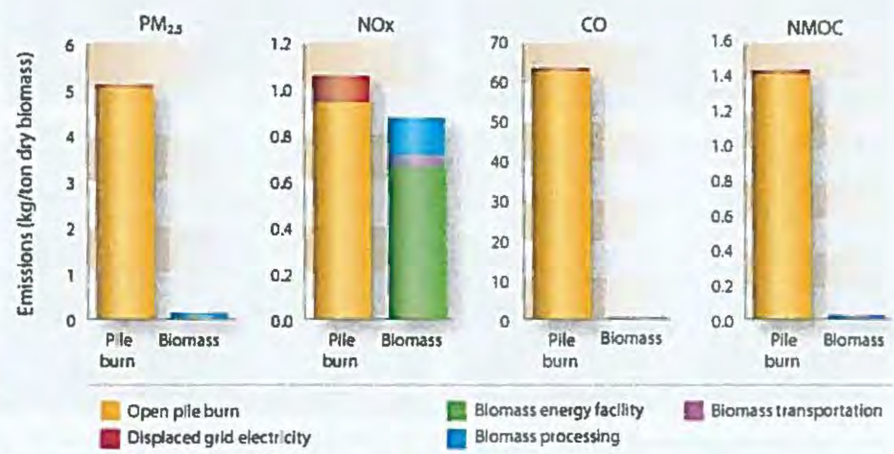


Fig. 5. Criteria air pollutant emissions comparison: pile burn versus biomass energy project.

Sales of greenhouse gas and criteria air pollution reductions as mitigation offsets to meet environmental review requirements would help to make forest biomass projects economically viable.

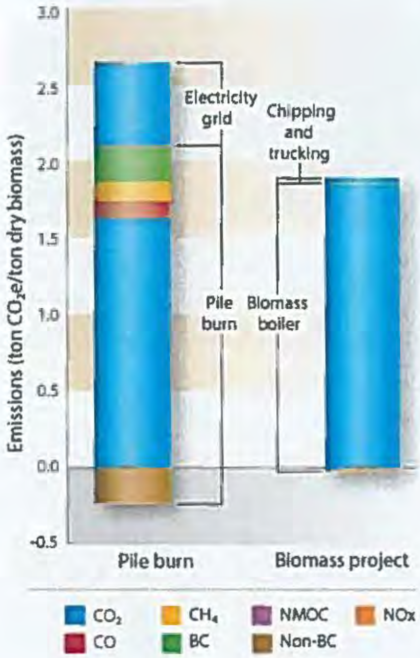


Fig. 6. Greenhouse gas emissions comparison: pile burn versus biomass energy project. (For the biomass energy project, the contribution to the CO_2e total for all of non-CO_2 constituents (CO, CH_4, NMOC, NOx, BC and Non-BC) is included, but the bars are not visible because they are insignificant in comparison to that from CO_2.)

Conclusion

Energy production and reductions in criteria air pollutants and GHG emissions were quantified from utilization of forest woody biomass wastes to fuel electricity generation as an alternative to open pile burning. However, biomass energy project economics were not favorable due to inefficient processing operations and the long transport distance between biomass origin and energy facility. Expected improvements in processing and transport efficiency alone will not bridge the gap. Sales of greenhouse gas and criteria air pollution reductions as mitigation offsets to meet environmental review requirements (such as those under the California Environmental Quality Act) would help to make forest biomass projects economically viable. A potential greenhouse gas value of \$20/ton CO_2-equivalent (the approximate rate of credits under South Coast Air Quality Management District Rule 2702, Greenhouse Gas Reduction Program) would add \$10/BDT to the biomass value and reduce the BRFS-BVBP project deficit by half. Monetizing criteria air pollutant reduction benefits could fully close the deficit. Under California's Carl Moyer Program, mitigation of NOx, NMOC and $PM_{2.5}$ is valued at up to \$16,000 per ton. There is a growing demand for such emissions reductions as air quality standards tighten and economic growth in rural air basins continues. For instance, new businesses and land development projects that generate emissions are often required to mitigate their impact under the California Environmental Quality Act review process or purchase emissions reduction credits to meet New Source Review requirements under the federal Clean Air Act.

A video documenting the BFRS biomass project was produced that includes interviews with a unique and diverse set of resource professionals, researchers, state and federal agency representatives, utility representatives and elected officials. The video can be viewed at http://vimeo.com/89771199. CA

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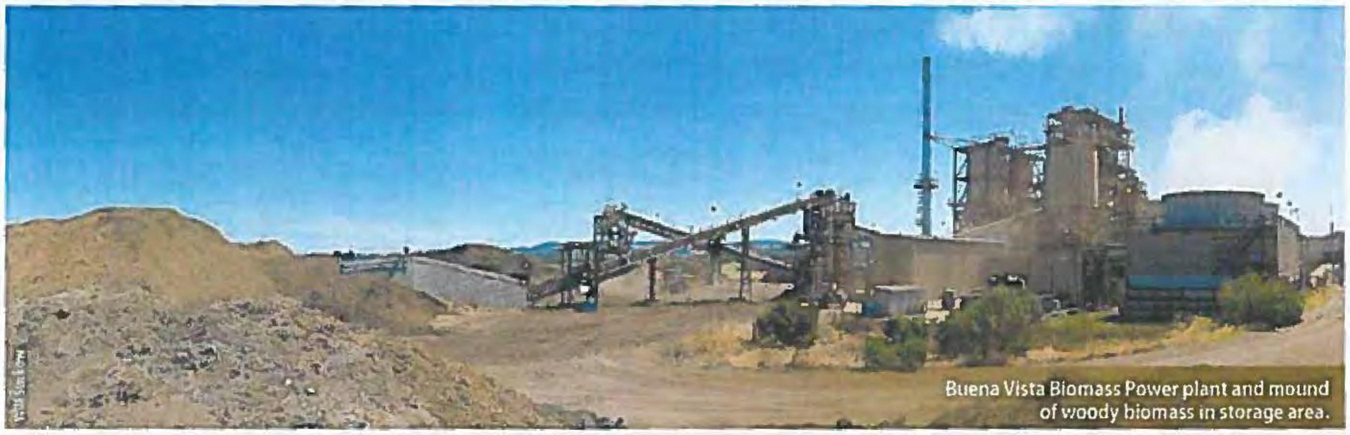

Buena Vista Biomass Power plant and mound of woody biomass in storage area.

TABLE 7. Emissions comparison between open pile burning and biomass energy project

		NOx	$PM_{2.5}$	BC	Non-BC	NMOC	CH_4	CO	CO_2	CO_2e
Baseline no project										
Open pile burn	tons	0.52	2.7449	0.1372	2.6077	0.7769	2.5896	34.338	884.6	
Electricity grid	tons	0.06	0.0188	0.0019	0.0169	0.0075	0.0038	0.098	288.7	
Biomass project										
Chip van	tons	0.02	0.0139	0.0002	0.0137	0.0009	0.0005	0.003	12.0	
Water truck	tons	0.00	0.0001	0.0000	0.0000	0.0001	0.0000	0.000	0.4	
Grinder	tons	0.05	0.0482	0.0014	0.0469	0.0025	0.0011	0.055	4.2	
Excavator	tons	0.04	0.0015	0.0011	0.0004	0.0038	0.0000	0.010	2.1	
Biomass boiler	tons	0.36	0.0041	0.0004	0.0037	0.0006	0.0003	0.018	1000.3	
Reductions										
	tons	0.10	2.70	0.14	2.56	0.78	2.59	34.3	154	
	kg/dry ton biomass	0.18	4.95	0.25	4.70	1.42	4.75	63.0	283.0	
	%	17.1%	97.5%	97.7%	97.5%	99.0%	99.9%	99.7%	13.1%	
	Global Warming Potential*	−4		900	−46	5	28	1.8	1	
	tons CO_2e†	−0.4	0.0	122.4	−117.8	3.9	72.6	61.8	154.3	296.7
	tons CO_2e/dry ton biomass									0.54

* From IPCC (2013).
† CO_2e = CO_2-equivalent.

TABLE 8. Emission factors used for comparison between open pile burning and biomass energy project

		NOx	$PM_{2.5}$	BC*	Non-BC*	NMOC	CH_4	CO	CO_2	Reference
Open pile burn†	g/kg dry biomass	1	5.3	5%	95%	1.5	5	66.3	1708	Baker et al. (2014)
Electricity grid	kg/MWh_e	0.08	0.025	10%	90%	0.01	0.005	0.13	384	CARB (2010)
Chip van	g/mile	4.17	0.05	75%	25%	0.15	0.08	0.59	10.2‡	CARB (2011)
	lb/mile dirt		0.6	0%	100%					CARB (1997)
Water truck	g/mile	9	0.3	75%	25%	0.4	0.2	1.2	10.2‡	CalEEMod (2013)
Grinder	g/bhp-hr	2.3	0.088	75%	25%	0.12	0.05	2.6	10.2‡	CalEEMod (2013)
	lb/ton wet biomass		0.1	0%	100%					U.S. EPA (1985)
Excavator	g/bhp-hr	7.5	0.28	75%	25%	0.71		1.89	10.2‡	CalEEMod (2013)
Biomass boiler	lb/$MMBtu_{biomass HHV}$	0.08	0.0009	10%	90%	0.00014	0.00007	0.004	219	Avogadro (2013)

* % of total PM, from Reid et al. (2005), McMeeking et al. (2013), U.S. EPA (2012), Chen (2007).
† Used with a 95% pile burn-out efficiency.
‡ kg CO_2/gal diesel fuel.

YES 100%

Clean Energy

By 2025

Walt Paniak
Diane Ryerson
[redacted]

Solar & Wind

+ Energy Storage

= Clean Energy

Clean Energy

ASAP

Walt Paniak
Diane Ryerson
[redacted]
Arcata, CA 95521

Vote YES for

Res. No. 2019-1

CAPCOA Policy Statement on Biomass Power Plants

Biomass power plants provide a number of societal benefits including significant air quality benefits. Biomass power plants are a primary alternative to the open burning of agricultural and forest waste and the emissions associated with open pile burning including criteria air pollutants (fine particulate matter (PM), carbon monoxide (CO), volatile organic compounds (VOC), and nitrogen oxides (NOx)), greenhouse gases (carbon dioxide (CO_2) and short lived climate pollutants of methane and black carbon), and organic air toxics. Comprehensive life cycle assessments show reductions of greater than 99% for PM and black carbon, from 95-99% for CO and VOCs, 70% for NOx, and up to 30% for CO_2.[1] [2] In the near term, the lack of biomass plants will undo much of the progress that has been made in reducing open burning and the levels of harmful air pollutants in the air we breathe.

Significant quantities of agricultural wastes are generated throughout California's highly productive valleys and foothills. These include fruit and nut orchard prunings and removals and pits and shells. Biomass power is currently the only economic disposal option.

Reducing fuel loads in the forest is a primary method of mitigating wildfire size and severity. The open burning of forest wastes is contrary to maintaining regional air quality. The biomass power industry provides a multifaceted beneficial alternative for disposing of forest debris and is a desirable part of the solution to the current tree mortality epidemic. By removing forest debris and using it to generate biomass power we can reduce the occurrence of catastrophic wildfires and the attendant damage to public resources and property, protect critical upland watersheds that ensure water quality, quantity, and forest ecosystem wildlife habitat, along with having a positive impact on air quality and energy resources.

Biomass power plants also burn urban woody biomass waste materials that are placed in landfills. Closure of biomass power plants will likely result in detrimental impacts on the state's efforts to reduce methane emissions from landfills and would also shorten the life of landfills. Clearly, biomass plants can and do play a role in meeting the state's landfill diversion requirements and greenhouse gas reductions and yet current state policies do not adequately recognize the societal, environmental, and public health benefits that are provided by these facilities.

The California Air Pollution Control Officers Association supports the following principles to maintain a viable biomass power industry in the California:

Require the purchase of biomass power at a rate that recognizes the other societal benefits of biomass power plants: The biomass industry does not compete

[1] California Agriculture, *Forest biomass diversion in the Sierra Nevada: Energy, economics and emissions*, Volume 69, Number 3, July-September 2015, available at: http://calag.ucanr.edu/archive/?issue=69_3.

[2] Journal of the Air & Waste Management Association, *Emission Reductions from Woody Biomass Waste for Energy as an Alternative to Open Burning*, Volume 61, January 2011.

well under the current procurement policies of the state's IOUs. Historically, biomass facilities have required 12-13 cents per kilowatt hour to retain economic viability. As the state's favorable policies and biomass power purchase contracts have expired over the past several years, this price point has placed biomass facilities at a competitive disadvantage with other renewable fuels which can be procured at a much lower cost. Under the state's Renewable Portfolio Standard program, pricing information is confidential, yet anecdotal evidence is that, currently, the IOUs are purchasing power from solar and wind facilities at approximately 5-8 cents per kilowatt hour, which is significantly below the actual non-subsidized cost of from 9-20 cents per kilowatt hour.

In order to close the gap between what is being offered to other subsidized renewable power producers (solar and wind), the California Public Utilities Commission (CPUC) has the authority to recognize "societal benefits" that are generated by power producers. In discussions with CPUC staff they have indicated that they take a narrow view of societal benefits and recognize only benefits that accrue directly to ratepayers. They do not monetize benefits such as air quality improvements, wildfire mitigation, landfill diversion, and public health cost savings in their ratemaking activities. The legislature could clarify this and mandate that "societal benefits" of biomass power described above be recognized in the price that is paid for biomass energy.

Provide Cap and Trade revenues to maintain a viable biomass power industry: Not only do biomass power plants reduce criteria pollutant emissions, but they also reduce greenhouse gas emissions by replacing power produced by fossil fuel fired plants. The state could provide revenues from the Cap and Trade program to recognize the greenhouse gas emission reductions associated with biomass power production. CARB should develop standardized methodologies to develop black carbon benefits of these projects, which can be done using information from PM emissions and other factors.

Modernize tipping fees and utilize funds for waste diversion including funding for biomass power: The current cap on the state's integrated waste management fee was established over two decades ago (1993). Since that time waste management facilities have been required to divert 75% of the material that used to end up in landfills. An increase in the state's portion of local waste management fees could help fund the development of landfill alternatives including biomass power plants and other uses for organic waste.

Investigate and develop alternatives to biomass: Current energy dynamics create a difficult environment for biomass power plants to remain viable. While every effort should be taken to save existing biomass power production, resources also need to be devoted to developing other long-term and sustainable alternatives for the disposal of agricultural and forest waste material. The state should provide resources to develop alternative uses for forest and agricultural waste materials. This must include the production of biochar, compost, and wood products, as well as assessments demonstrating the ability of current forest and agricultural practices to support existing biomass power production.

Encourage local use of biomass waste: Biomass plants realize the greatest emissions benefits when they are using waste generated in the local area. The long distance transport of biomass waste, even when not burned in a biomass plant, generates significant emissions by itself and transport of fuels from remote areas to areas with significant air quality concerns should be discouraged. This includes supporting the BioMat program at the CPUC with program constructs and potentially larger allocations of MW for the program, and larger allocations to the California Energy Commission's EPIC program to fund the development of novel technologies that can utilize this waste for energy.

Baseload Power value: It is well known that the huge increase in intermittent renewables has driven up the need for baseload power. As the CPUC's own analysis has shown, integration of intermittent renewables into the grid requires significant additional costs, including backup generation, costs to stabilize the grid and more. The costs of integrating solar and wind will only increase as increasing amounts will have be curtailed. A recent study by Energy and Environmental Economics (E3) made clear that increasing the diversity of California's renewables portfolio will reduce curtailment and provide the lowest cost option to achieve a 50 percent RPS.[3]

The National Renewable Energy Labs (NREL) reached the same conclusion when it considered the feasibility of the United States moving to 80 percent renewables by mid-century. Like E3, NREL found that an 80 percent RPS is feasible, but only if we significantly increase the production of baseload and flexible generation renewables.[4] Specific policies to increase baseload and flexible generation power include:

- A specific requirement or portfolio standard for baseload and flexible generation that ensures that these resources provide at least 3,500 additional megawatts of baseload and flexible generation. This could be similar to the energy storage portfolio standard to ensure that a variety of baseload and flexible generation technologies help to achieve the requirement. It will also help California prepare for the possible closure of the Diablo Canyon nuclear generating facility.
- Allocate a portion of EPIC funding to baseload and flexible generation power to better quantify the grid, economic and environmental benefits of baseload and flexible generation power.

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[3]National Renewable Energy Labs, *Renewable Energy Futures*, available at: http://www.nrel.gov/analysis/re_futures/; Energy and Environmental Economics, *Investigating a Higher Renewables Portfolio Standard in California*, January 2014; Union of Concerned Scientists: *Achieving 50 Percent Renewable Electricity in California*, 2015. Available at: http://www.ucsusa.org/sites/default/files/attach/2015/08/Achieving-50-Percent-Renewable-Electricity-In-California.pdf.

[4] NREL, footnote 3, above.

From:	Cena Marino
To:	Lori Taketa
Subject:	Clean energy by 2025
Date:	Saturday, March 30, 2019 10:33:26 AM

I couldn't make the TCEA meeting, but please act ASAP to do everything you can to reduce CO_2 emmisions. Save our planet and living 'things' on it!
Cena Marino
Sent from my iPhone