BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Continue Implementation and Administration, and Consider Further Development, of California Renewables Portfolio Standard Program.	Rulemaking 18-07-003

INFORMAL COMMENTS OF CENTER FOR BIOLOGICAL DIVERSITY, SIERRA CLUB, AND THE PARTNERSHIP FOR POLICY INTEGRITY ON THE BIOMAT PROGRAM REVIEW AND STAFF PROPOSAL

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The Center for Biological Diversity, Sierra Club, and the Partnership for Policy Integrity (collectively, "Environmental Groups"), respectfully submit the following comments on the Bioenergy Market Adjusting Tariff ("BioMAT") Program Review and Staff Proposal. These comments include an overview section as well as specific responses to questions noted in the Staff Proposal.

Bioenergy, in particular Category 3 biomass, is a dirty fuel. Classifying it as a "renewable resource" is a fiction of policy and does not represent scientific realities. In this letter, the Environmental Groups will present data that challenges the notion that these facilities benefit the environment or ratepayers. Biomass emits more CO_2 at the smokestack than fossil fuel generation, and it incentivizes forest management practices that both emit greenhouse gases ("GHGs") and reduce carbon storage. When substituted for fossil fuel generation, biomass generation produces more GHG and air pollutant emissions at a higher financial cost. When bioenergy is substituted for zero-carbon fuels such as wind and solar, the detriment to air quality and the climate is even worse.

The Environmental Groups urge the Department of Energy and the California Public Utilities Commission ("Commission") to use these revisions as an opportunity to incorporate science-based decision-making into the BioMAT program. The BioMAT program should be revised so as to ensure that contracts are awarded only to projects that reduce identified risks and produce environmental benefits. The program should not be expanded to prop up projects that offer fewer benefits at greater costs.

OVERVIEW

I. BioMAT Participation to Date Shows that Market Transformation is Unlikely and the Proposed Revisions Fail to Address This Underlying Issue.

The Staff Proposal recommends a number of measures to expand participation in the BioMAT program. However, rather than dedicate more time and resources to the expansion of the BioMAT program, the Commission should view the program's lack of success as a sign that

market transformation is unlikely to occur. The relative failure of the BioMAT program thus far demonstrates that small-scale biomass and biogas facilities are extraordinarily difficult to justify economically.

Further, as described in detail below, the BioMAT program proposes to charge ratepayers twice: once when subsidizing bioenergy generation and again when dealing with the consequent negative impacts of climate change. The Commission should weigh the unjustifiable economics of the BioMAT program with the lack of real environmental and societal benefits and conclude that it cannot support additional ratepayer subsidies or market interventions.

II. Category 1 Bioenergy (Biogas Generation) is Costly and Negatively Impacts Air Quality and the Climate.

The projects originally envisioned for the BioMAT program—particularly biogas projects—produce very mixed environmental and health impacts. Burning biogas releases the same criteria pollutants as fossil natural gas, including nitrogen dioxide, carbon monoxide, nitric oxide, formaldehyde, acetaldehyde, and ultrafine particles, all of which are harmful to human health.[1] Biogas projects that use anaerobic digesters have been shown to reduce methane emissions by between 25 and 40 percent,[2] but also produce digestate that increases ammonia by 81 percent, in addition to releasing methane and nitrous oxides.[3] Ammonia, in particular, is a precursor to fine particulate matter, impacting the environment and human health in communities in close proximity to biogas facilities.

Furthermore, the sources of waste for biogas, including dairies and landfills, produce additional air and water pollutants and have significant negative impacts on the health of nearby communities, which are more likely to be disadvantaged communities. The Commission should be very careful not to generate increased incentives for new or expanded waste sources. Any equitable solution to meet California's climate goals must consider the externalities of incentivizing these projects. For the purposes of the BioMAT program, biogas projects should be scrutinized and evaluated on their ability to produce tangible benefits that significantly outweigh their negative impacts. Where biogas projects produce adverse environmental and/or health impacts—particularly in disadvantaged communities—BioMAT contracts should not be awarded.

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[1] *See* Jennifer Logue et al., *Pollutant Exposures from Natural Gas Cooking Burners: A Simulation-Based Assessment for Southern California* ,Vol. 122 No. 1Environmental Health Perspectives at pp. 43-50, (2013); Victoria Klug and Brett Singer. *Cooking Appliance Use in California Homes—Data Collected from a Web-based Survey*, Lawrence Berkeley National Laboratory (Aug. 2011); John Manuel, *A Healthy Home Environment?*, Vol. 107, No. 7 Environmental Health Perspectives at pp. 352–357 (1999); Nasim Mullen et al. *Impact of Natural Gas Appliances on Pollutant Levels in California Homes*, Lawrence Berkeley National Laboratory (2012).

[2] Michael A. Holly, et al., *Greenhouse gas and ammonia emissions from digested and separated dairy manure during storage and after land application*, Vol. 239 Agriculture, Ecosystems and Environment at pp. 410-419, 416 (2017).

[3] *Id.* at p. 417.

III. Category 3 Bioenergy (Biomass Generation) is Costly and Degrades Forest Ecosystems, Air Quality, and the Climate.

A. Biomass Generation Emits More Greenhouse Gases than Fossil Fuel Generation.

Unlike other renewables, biomass generation emits GHGs. The California statewide greenhouse gas inventory reports biogenic CO_2 emissions from electricity generation.[4] The Mandatory Reporting Regulation ("MRR") program, data from which are used to generate the state's inventory, specifically requires reporting of biomass GHG emissions.[5] The Staff Proposal acknowledges that bioenergy generation has associated GHG emissions.[6] In fact, biomass generation can be *even more climate damaging* than fossil fuel generation.

In terms of actual smokestack emissions, biomass generation is three to four times more carbon-intensive than natural gas-fired generation, and even more carbon-intensive than coal-fired generation. Measured at the stack, biomass combustion produces significantly more CO_2 per megawatt-hour than fossil fuel combustion. A biomass-fueled boiler may have an emissions rate far in excess of 3,000 lbs CO_2/MWh. Smaller-scale facilities using gasification technology—like the facilities currently being proposed under the SB 1122 feed-in tariff for small-scale bioenergy (see Public Utilities Code section 399.20(f))—are similarly carbon-intensive. For example, the Cabin Creek bioenergy project approved by Placer County would have an emissions rate of more than 3,300 lbs CO_2/MWh.[7] As one recent scientific article noted, "[t]he fact that combustion of biomass generally generates more CO_2 emissions to produce a unit of energy than the combustion of fossil fuels increases the difficulty of achieving the goal of reducing GHG emissions by using woody biomass in the short term."[8]

By way of comparison, California's 2012 baseline emissions rate from the electric power sector—which includes only large, fossil-fired electric generating units subject to federal GHG

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[4] *California Greenhouse Gas Inventory for 2000-2016 — by IPCC Category* at 6 (updated June 22, 2018) ("California Inventory"), *available at* https://www.arb.ca.gov/cc/inventory/data/tables/ghg_inventory_ipcc_sum_2000-16.pdf . The national inventory produced by U.S. EPA similarly "counts" biomass CO2, although it uses the IPCC convention of "counting" those emissions in the Land Use, Land Use Change, and Forestry sector rather than in the Energy sector. *See* U.S. EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks 2000-2015 at pp. ES-7, 2-12 (Apr. 2017) ("EPA GHG Inventory 2000-2015"), *available at* https://www.epa.gov/sites/production/files/2017-02/documents/2017_complete_report.pdf.

[5] 17 Cal. Code Regs. §§ 95101(b)(4), 95103(a)(2), (j).

[6] *See, e.g*,. BioMAT Program Review and Staff Proposal, Question 18 at p. 22, "Achieving pollution and GHGs reductions was an original goal of BioMAT. However, whether or not individual projects reduce net lifecycle emissions depends on project-specific factors."

[7] Ascent Environmental, *Cabin Creek Biomass Facility Project Draft Environmental Impact Report*, App. D (July 27, 2012) (describing 2 MW gasification plant with estimated combustion emissions of 26,526 tonnes CO2e/yr and generating 17,520 MWh/yr of electricity, resulting in an emissions rate of 3,338 lbs CO2e/MWh).

[8] David Neil Bird, et al., *Zero, one, or in between: evaluation of alternative national and entity-level accounting for bioenergy*, Vol. 4 GCB Bioenergy 576, 584 (2012), doi:10.1111/j.1757-1707.2011.01137.x.

performance standards—was 954 lbs CO_2 per MWh.[9] California's actual grid emissions intensity is likely far lower, given the increasing dominance of renewables and storage. Accordingly, replacing California grid electricity with biomass electricity likely at least *triples* emissions rates—and replacing truly low-carbon renewables with biomass is far worse. Failure to accurately assess emissions associated with bioenergy generation seriously undermines California's ability to meet its climate goals.

B. Biomass Generation Emits Harmful Air Pollutants.

In addition to producing large amounts of CO_2, biomass generation can result in significant emissions of air pollutants that harm human health, including nitrogen oxides, carbon monoxide, particulate matter, and black carbon.[10] Biomass burning also emits large amount of federally-regulated hazardous air pollutants ("HAPs"), including hydrochloric acid, dioxins, benzene, formaldehyde, arsenic, chromium, cadmium, lead, and mercury.[11] Many biomass air pollution emissions can exceed those of coal-fired power plants even after application of best available control technology.[12]

C. Biomass Generation Incentivizes Forest Management Practices that Produce Greenhouse Gas Emissions and Reduce Forest Carbon Storage and Do Not Adequately Protect Communities from Forest Fires.

Biomass procurement subsidizes forest management activities—such as those outlined in the Forest Climate Action Team's California Forest Carbon Plan[13]—that have substantial GHG impacts. The California Forest Carbon Plan proposes large-scale increases in logging and mechanical thinning that will reduce carbon storage and rates of carbon sequestration and increase overall emissions in California, exacerbating the devastating impacts of climate change.[14]

Several studies have demonstrated that thinning forests and burning the resulting materials for bioenergy can result in a loss of forest carbon stocks and a transfer of carbon to the atmosphere lasting decades to more than a century. Because it is impossible to know in advance when

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[9] *See E&E's Power Plan Hub*, E&E News, *available at* http://www.eenews.net/interactive/clean_power_plan/states/california (visited Nov. 26, 2018).
[10] Mary S. Booth, *Trees, Trash and Toxics: How biomass energy has become the new coal. Partnership for Policy Integrity* (Apr. 2, 2014), *available at* https://www.pfpi.net/wp-content/uploads/2014/04/PFPI-Biomass-is-the-New-Coal-April-2-2014.pdf.
[11] *Id.* at p. 38.
[12] *Id.* at p. 41.
[13] *See* Forest Climate Action Team, *California Forest Carbon Plan: Managing Our Forest Landscapes in a Changing Climate*, (May 2018), *available at* http://resources.ca.gov/wp-content/uploads/2018/05/California-Forest-Carbon-Plan-Final-Draft-for-Public-Release-May-2018.pdf
[14] *See, e.g.*, Zhengxi Tan, et al., *Ecosystem carbon stocks and sequestration potential of federal lands across the conterminous United States*, Vol. 112 PNAS 12723 at 12724 and Table 2 (2015); B.M. Depro et al., *Public land, timber harvests, and climate mitigation: Quantifying carbon sequestration potential on U.S. public timberlands*, Vol. 255 Forest Ecology and Mgmt. 1122 (2008); John L. Campbell et al., *Can fuel-reduction treatments really increase forest carbon storage in the western US by reducing future fire emissions*?, Vol. 10 Frontiers in Ecology and the Env't 83 (2011) doi:10.1890/110057.

wildfire will occur in a thinned stand, thinning operations may remove carbon that would not have been released in a wildfire within the effective life of the thinning operation. One recent study concluded, for this and other reasons, that thinning operations tend to remove about three times as much carbon from the forest as would be avoided in wildfire emissions.[15] Another report from Oregon found that thinning operations resulted in a net loss of forest carbon stocks for up to 50 years.[16] Another published study found that even light-touch thinning operations in several Oregon and California forest ecosystems incurred carbon debts lasting longer than 20 years.[17] Other recent studies have shown that intensive harvest of logging residues that otherwise would be left to decompose on site can deplete soil nutrients and retard forest regrowth as well as reduce soil carbon sequestration.[18]

Mechanical thinning can also negatively impact forests and wildlife—which have evolved alongside mixed-severity fires—by reducing the structural complexity of mature forest habitat. Mechanical thinning does not mimic natural wildfire and largely eliminates standing dead trees and downed woody material—components critical to the forest ecosystem and which many rare wildlife species preferentially select for habitat and food. There is broad scientific agreement that "snag forest habitat" (the patches of dead trees created by high-intensity fire, bark beetles, and drought) are incredibly important for biodiversity, habitat heterogeneity, and forest health.[19] In fact, snag forests are among the most biodiverse wildlife habitat in the western U.S., comparable to old-growth forest.[20] Many native wildlife species are primarily or almost exclusively found in snag forest habitat due to the high abundance of snags and downed logs, shrub patches, and young natural regeneration of conifers and oaks. Scientific research has established that mechanical thinning (including the removal of dead trees through post-fire salvage logging) causes numerous ecological harms,[21] such as the loss of wildlife habitat, loss of carbon storage, spread of weeds, sedimentation into streams, soil compaction, disruption of nutrient flows, and

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[15] John L. Campbell et al., *Can fuel-reduction treatments really increase forest carbon storage in the western US by reducing future fire emissions*?, Vol. 10 Frontiers in Ecology and the Env't 83 (2011), doi:10.1890/110057.

[16] Joshua Clark et al., *Impacts of Thinning on Carbon Stores in the PNW: A Plot Level Analysis*, Final Report Ore. St. Univ. College of Forestry (May 25, 2011).

[17] Tara Hudiburg et al., *Regional carbon dioxide implications of forest bioenergy production*, Vol. 1 Nature Climate Change 419 (2011), doi:10.1038/NCLIMATE1264.

[18] David L. Achat et al., *Forest soil carbon is threatened by intensive biomass harvesting*, Vol. 5 Sci. Reports 15991 (2015), doi:10.1038/srep15991; David L. Achat et al., *Quantifying consequences of removing harvesting residues on forest soils and tree growth – A meta-analysis*, Vol. 348 Forest Ecology &Mgmt. 124 (2015).

[19] Mark E. Swanson. et al., *The forgotten stage of forest succession: early-successional ecosystems on forested sites*, Vol. 9 Frontiers in Ecology and Env't 117; Dominick A. DellaSala et al., *Complex early seral forests of the Sierra Nevada: what are they and how can they be managed for ecological integrity?*, Vol. 34 Nat. Areas Journal 310 (2014).

[20] *See* review in Dominick DellaSala Chad Hanson (eds), *The Ecological Importance of Mixed-severity Fires: Nature's Phoenix* Elsevier (2015).

[21] D.C. Donato et.al., Post-Wildfire Logging Hinders Regeneration and Increases Fire Risk, Vol. 311 Science 352 (2006); D. B. Lindenmayerand R. F. Noss, *Salvage logging, ecosystem processes, and biodiversity conservation*, Vol. 20 Conservation Biology:949 (2006).

disturbance to sensitive wildlife including spotted owls,[22] Pacific fishers,[23] black-backed woodpeckers,[24] and olive-sided flycatchers,[25] among others.

Furthermore, this method of forest management does not meaningfully address the threats forest fires pose to human safety, structures, and property. Communities near forested areas can best be protected through specific home protecting measures. Scientific studies indicate that the only effective way to protect structures from fire is to reduce the ignitability of the structure itself (e.g., fireproof roofing, leaf gutter guards, external sprinklers) and the immediate surroundings within about 100 feet from each home (e.g., through thinning of brush and small trees adjacent to the homes).[26] As such, forest management projects incentivized by biomass generation miss the mark where wildfire safety is concerned. Ratepayers should not be forced to subsidize forest management projects that will exacerbate climate change, degrade forest ecosystems, and fail to make them safer in the face of wildfires.

D. Biomass Generation is More Expensive than Traditional Energy Generation and Other Renewable Generation.

BioMAT facilities produce energy that can be five times more expensive than wind and solar. According to the BioMAT Program Review document, the BioMAT program has a "soft cap" of $197/MWh. In a letter to the Commission, Pacific Gas and Electric (PG&E) indicated that they were very likely to be required to purchase energy at $199.72/MWh.[27] In contrast, PG&E reported that they pay $40/MWh for wind and solar. These prices are passed on to PG&E ratepayers. These prices are only reasonable when ratepayers receive significant non-energy benefits in exchange, and BioMAT projects have not yet been shown to provide sufficient benefits to justify the costs.

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[22] Claire Virginia Gallagher, 2010. *Spotted owl home range and foraging patterns following fuels-reduction treatments in the northern Sierra Nevada, California*, M.S. thesis, Univ. of Calif., Davis (2010).

[23] James D. Garner, *Selection of disturbed habitat by fishers (Martes pennanti) in the Sierra National Forest*, M.S. thesis, Humboldt State Univ. (2013).

[24] Richard L. Hutto,*The ecological importance of severe wildfires: some like it hot*, Vol. 18 Ecological Applications 1827 (2008).

[25] Bruce A. Robertson and Richard L. Hutto, *Is selectively harvested forests and ecological trap for olive-sided flycatchers?*, Vol. 109 The Condor 109 (2007).

[26] Jack D. Cohen,. *Preventing disaster: home ignitability in the Wildland-Urban Interface*, Vol. 98 J. of Forestry 15 (2000); Jack D. Cohen, and Richard D. Stratton, *Home destruction examination: Grass Valley Fire, Lake Arrowhead, California*, U.S. Forest Service Technical Paper R5-TP-026b. U.S. Forest Service, Region 5, Vallejo, CA (2008); Philp Gibbons et al., *Land management practices associated with house loss in wildfires*. Vol. 7 PLoS ONE e29212.

[27] Docket No. R. 11-05-005, Motion of Pacific Gas and Electric Company (U39-E) to Suspend BioMAT Program Procurement, (Cal. Pub Pub. Util. Comm'n Dec. 1, 2017), *available at* http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M201/K962/201962715.PDF.

RESPONSES TO STAFF PROPOSAL QUESTIONS

1. Do you support the proposal to reduce the market depth requirement from five to three for unaffiliated applicants? Why or why not?

The BioMAT program is unsuccessful because small-scale energy projects are expensive and energy from these facilities is not desirable to utilities that can purchase zero-carbon, renewable wind and solar energy for a fraction of the cost. Additionally, we share Staff's concern that a small number of developers with a large stake in a specialized market increases the potential for market manipulation. With a smaller pool of unaffiliated applicants, the market power of individual developers is proportionately greater. The Commission should be very hesitant to reduce the market depth requirement and further expose ratepayers to the risk of inflated costs. As such, the market depth requirement should not be reduced. Rather, the inability for the BioMAT program to fulfill the current, lenient market depth requirement is a justification for reevaluating the BioMAT program's effectiveness at meeting program objectives.

2. Do you support proposal 2 to revise when the BioMAT offer price moves up, moves down, and stays the same? Why or why not?

The Commission should adopt proposal 2. The current rule increases the offer price if the total capacity accepting an offer price is less than 20% after just one program period. The proposed change would increase the offer price if less than two projects accept an offer price during the course of two program periods. Doubling the amount of time before the offer price increases will slow offer price increases that could result in higher ratepayer costs.

3. Should the Commission transition to a fixed price feed-in-tariff instead of the price adjusting mechanism? Why or why not?

If the Commission does transition to fixed price feed-in-tariff, the price must reflect the harms (GHG and criteria pollutant emissions) and costs associated with BioMAT projects. If the costs and harms require a high price, the Commission should avoid overburdening the ratepayer to fund an otherwise infeasible BioMAT program.

> ***a. If so, how should the market price(s) be determined?***
>
> The price determination should heavily consider the interests of the California ratepayer, including not only the electricity costs but also the costs and harms that stem from GHG and criteria pollutant emissions. It should also consider the cost of zero-emission renewables (wind, solar, etc.). Where zero-emission renewables are cheaper and provide more benefits in terms of reduced emissions in comparison to biomass energy, the Commission should opt to prefer those projects. The price determination should not seek to account for long-distance transportation of feedstock as projects ought to be located in close proximity to their feedstocks.

5. Should the Commission consider changes to the BioMAT definition of "unaffiliated applicants" to better ensure that projects with common developers count as affiliated for the purpose of determining market depth? Why or why not?

The commission should change the BioMAT definition of unaffiliated applicants to count projects with common developers as affiliated. A market should not be dominated by one or two developers, as this could lead to market manipulation and a lack of competition that will drive up ratepayers costs.

7. Are there any other program pricing proposals that the Commission should consider? If so, explain the proposal and how it would be consistent with Public Utilities Code section 399.20.

Any pricing proposals should consider the BioMAT program's high cost to ratepayers and should not allow facilities to sell bioenergy at prices that are excessive, especially when compared to other types of renewable generation. Non-economic facilities should not be allowed to sell electricity at high costs merely to avoid the termination of the BioMAT program.

10. Do you support the proposal to extend the current program end date for an additional five years, from February 2021 to February 2026? Why or why not?

No. Implementation of the BioMAT program was premature as the potential emissions of these facilities, their economics, and their adverse public health impacts were not adequately considered. Furthermore, the justification for category 3 BioMAT facilities is suspect. There is a low likelihood that the "hazardous trees" burned in a BioMAT facility would have been incinerated in a wildfire. And, as discussed above, biomass generation increases GHG emissions and reduces carbon storage at a faster rate than can be replenished. Therefore, we suggest that the Commission reevaluate any claims that category 3 facilities will reduce net CO_2 emissions before extending the BioMAT program end date.

11. Do you support the proposal to extend a project's Guaranteed Commercial Operation Date by 12 months if it fails to interconnect by the PPA's Guaranteed Commercial Operation Date due to delays beyond the Seller's reasonable control? Why or why not?

If the Commission chooses to adopt this proposal, "delays beyond the seller's reasonable control" must be narrowly and strictly defined. The BioMAT program is fraught with difficulties for developers and producers. However, many of these difficulties should be anticipated by the sellers and should not be considered "beyond reasonable control." If adopted, this proposal should be narrowly defined and exclusively apply to natural disasters and other acts of God that a seller truly could not have anticipated.

12. Do you support the proposal to remove the three MW cap on payments via BioMAT PPAs for facilities larger than three MW? Why or why not?

No. The three MW cap ensures that BioMAT projects remain small, do not centralize large quantities of emissions, and do not create a demand for fuel material beyond what immediate forest surroundings can provide. Increasing the generation limit for BioMAT projects would

allow sellers to build larger, centralized facilities, potentially making the BioMAT program more desirable to developers and sellers. However, the Commission must look beyond the economic arguments for raising the generation cap.

First, the Commission does not currently have the statutory authority to increase the cap, as we explain in our response to question 12(a) below. Second, alterations to the BioMAT program should be justified only by improved ability to meet program objectives. For Category 3 BioMAT projects, program objectives include promoting sustainable and resilient forests, reducing the risk of high-intensity wildfires, reducing the use of open pile burning, and protecting public safety and infrastructure. No evidence has been produced that increased generation size will advance the first three factors, but increasing the program cap would enable additional emissions and incentivize larger, centralized facilities, producing more intense emissions and negative health impacts for nearby communities. Additionally, larger, centralized facilities could potentially produce outsize demand for fuel material beyond what is needed for prudent forest management. For these reasons, we recommend not increasing the size cap on BioMAT PPAs.

> ***a. Do you believe that the Commission can implement this change under existing statutory authority, or would legislation be required to enable BioMAT PPAs for capacities greater than three MW?***
>
> Additional legislation would be needed to increase the three MW cap on payments for BioMAT PPAs. The California Public Utilities Code limits eligible projects to those that have "an effective capacity of not more than three megawatts, with the exception of those facilities participating in a tariff made pursuant to paragraph (2) of subdivision (f)," the section on the BioMAT program.[28] Subsection (f)(2)(E)(i) then clarifies that, even though facilities with a nameplate capacity of five MW may participate in the program, BioMAT eligibility is restricted to bioenergy facilities that deliver "no more than three megawatts to the grid at any time."[29] Given this statutory language, the Commission is not authorized to award PPAs to facilities sized more than three MW unless those facilities are somehow guaranteed to provide "no more than three megawatts to the grid at any time." That is, under subsection (f)(2)(E)(i), the Commission can only pay a facility for three megawatts or less of bioenergy. The staff recommendation to increase the generation limit cannot legally be implemented unless the state legislature provides additional authorization.

14. Do you support the proposal to temporarily set an 80% HHZ fuel requirement for Category 3? Why or why not?

The Commission should set an 80% HHZ fuel requirement for Category 3 projects in order to prioritize the utilization of true hazard trees that pose a danger to public safety. However, the maps defining HHZ fuels are overbroad and include remote areas where tree removal efforts would negatively affect forest ecosystems. In order to ensure that the BioMAT program effectively promotes removal of actual hazard trees, the Commission should set an 80% fuel

[28] Cal. Pub. Util. Code 399.20(b)(1).
[29] Cal. Pub. Util. Code 399.20(f)(2)(E)(i).

requirement limited to hazard tree removals from HHZ Tier 1 areas (i.e., high hazard zones that are in close proximity to communities, roads, and utility lines and represent a direct threat to public safety). If BioMAT facilities are indeed critical to facilitating the removal of hazard trees, then setting a high minimum HHZ fuel requirement is imperative. The HHZ Tier 2 maps include remote areas far from roads, houses, and power lines, and make no consideration of ecological impact or operational practicality. Prior to including HHZ Tier 2 areas in new category 3 BioMAT contracts, the HHZ map would need to be updated to reflect ecological and operational realities, based on the best available science.

a. If not, how should the Commission ensure that the goals of the Governor's May 2018 Executive Order are met?

Prior to the May 2018 executive order, the Governor released an Emergency Proclamation pertaining to the "Tree Mortality Crisis." While this proclamation heavily emphasized biomass incineration, it also ordered CalTrans and DGS to map where mulch made from HHZ trees could be utilized along road corridors and around state-owned buildings. Further, the May 2018 Executive Order appropriated money for innovative wood products that could utilize HHZ and otherwise non-merchantable woody material. The Commission ought to encourage its partners at other agencies to comply with relevant executive order provisions. Other utilization methods (mulch, compost, etc.) store carbon and do not release the greenhouse gas and criteria pollutants associated with incineration. Due to these environmental benefits, these alternative utilization methods should be preferred over biomass-incineration projects.

b. If not, would you support lowering the offer price for projects that do not commit to using at least 80% HHZ fuel? Please explain.

Category 3 BioMAT projects are intended to utilize hazardous trees. Therefore, a category 3 BioMAT project that does not meet the minimum 80% HHZ fuel standard would benefit from the ratepayer subsidies of the BioMAT program without sufficiently contributing to the goals of the category 3 designation. As this letter has detailed, BioMAT projects are expensive and dirty. BioMAT projects that do not substantially contribute to the goals of the Category 3 designation do not adequately benefit Californians and therefore fall outside the scope of the program.

18. Achieving pollution and GHGs reductions was an original goal of BioMAT. However, whether or not individual projects reduce net lifecycle emissions depends on project-specific factors. Do you think that the Commission should establish a requirement that facilities reduce emissions as a condition for BioMAT eligibility? In your response, please explain how such a program requirement would complement or not complement the work of other state or local agencies that regulate or provide grants to BioMAT-eligible facilities.

Projects should absolutely be required to demonstrate net GHG emissions reductions as a precondition for BioMAT eligibility. California, along with the rest of the world, is facing a climate crisis the worst impacts of which can only be avoided by an immediate transition to zero-

carbon renewable energy.[30] To that end, California has set short-term and long-term climate goals. Precisely because RPS eligibility does not depend on GHG reductions, the Commission should ensure that only projects that do not interfere with the state's GHG reduction goals are eligible for BioMAT. In addition, as described further below, a net GHG emissions reductions requirement for BioMAT projects is necessary to ensure clarity and consistency with existing laws.

A recent 2018 report from the Intergovernmental Panel on Climate Change (IPCC) highlights the necessity of limiting warming to 1.5°C to avoid catastrophic impacts to people and life on Earth.[31] In order to avoid the catastrophic consequences associated with warming above 1.5°C, the 2018 IPCC report provided a global carbon budget for a reasonable likelihood of limiting temperature rise to 1.5°C of between 420 $GtCO_2$ and 570 $GtCO_2$ (depending on the temperature dataset used), from January 2018 onwards.[32] At the current emissions rate, this carbon budget would be expended in just *10 to 14 years*, underscoring the urgent need for immediate, transformative global action for a just transition from carbon-intensive fossil fuels to clean energy.[33]

A September 7, 2018, letter from Governor Brown announced that California is committed to addressing this threat through "a sustainable future without reliance on fossil fuels."[34] In 2015, Governor Brown established a goal of reducing emissions 40 percent below 1990 levels by 2030,[35] which the Legislature codified in SB 32 (Pavley, 2016). To support this goal, SB 100 (DeLeon, 2018) mandates that 100 percent of total retail sales of electricity in California come from renewable energy resources and zero-carbon resources by 2045. Simultaneously, Governor Brown issued Executive Order B-55-18, setting a statewide goal of carbon neutrality by or before 2045 and net negative GHG emissions thereafter.[36]

California cannot meet these mandates if it continues to promote GHG-emitting energy generation. As EPA's Science Advisory Board panel on biogenic CO_2 emissions concluded, bioenergy cannot be considered a priori "carbon neutral."[37] Rather, biogenic carbon emissions vary considerably as a result of feedstock types and sources, production methods, and leakage effects. According to California's 2015 greenhouse gas emissions inventory (covering 2000-2015), reported GHG emissions from bioenergy generation have ranged between 4.79 and 9.16

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[30] *See* Intergovernmental Panel on Climate Change, Global Warming of 1.5°C, an IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty (Oct. 6, 2018) ("IPCC Report"), *available at* http://www.ipcc.ch/report/sr15/.
[31] *Id.*
[32] *Id.*
[33] *Id.*
[34] Letter from the Office of the Governor to the Honorable Ryan Zinke, Secretary, (Sept. 7, 2018).
[35] Executive Order B-30-15 (Apr. 2015).
[36] Executive Order B-55-18, https://www.gov.ca.gov/wp-content/uploads/2018/09/9.10.18-Executive-Order.pdf.
[37] U.S. EPA, Science Advisory Board, *SAB Review of EPA's Accounting Framework for Biogenic CO2 Emissions from Stationary Sources* 18 (Sept. 2012) ("SAB Review.").

million metric tons per year.[38] A net GHG emissions reductions requirement ensures that bioenergy procurement does not impede California's ability to meet its short- or long-term climate goals.

Furthermore, a net GHG emissions reduction requirement would complement other Commission priorities and directives, including RPS contracting, IRP development, and compliance with state climate laws.

A. A requirement that BioMAT participants show net GHG reductions is necessary to ensure clarity and accuracy in RPS contracting.

The Public Utilities Code defines a renewable energy credit ("REC") as including "all renewable and environmental attributes associated with the production of electricity from the eligible renewable energy resource," but expressly excludes from these "attributes" the "treatment benefits created by the utilization of biomass or biogas fuels."[39] The Commission implemented this distinction in D.08-08-028, defining the "avoided emissions" included in the REC as the emissions from fossil-fueled generation displaced by renewable generation, but excluding "treatment benefits" such as avoided waste and "upstream emissions" from the REC.[40]

In contrast, the definition of "Green Attributes" used in some RPS contracts appears to capture "treatment benefits," at least to the extent necessary to ensure "zero net emissions" from bioenergy generation. In D.13-05-034, for example, the Commission adopted a definition of "Green Attributes" proposed by the utilities in a joint submission of standard contract terms for feed-in tariff facilities.[41] That provision, as relevant here, defined "Green Attributes" as "any and all credits, benefits, emissions reductions, offsets, and allowances, howsoever entitled, attributable to the generation from the Project, and its avoided emission of pollutants," including but not limited to "Renewable Energy Credits, as well as: ... (2) any avoided emissions of carbon dioxide (CO2), methane (CH4), nitrous oxide, ... and other greenhouse gases (GHGs)...."[42] The definition also provided that "[i]f the Project is a biomass or biogas facility and Seller receives any tradable Green Attributes based on the greenhouse gas reduction benefits or other emission offsets attributed to its fuel usage, it shall provide Buyer with sufficient Green Attributes to ensure that there are zero net emissions associated with the production of electricity from the Project."[43] The utilities' BioMAT Joint Submission carried this definition of "Green Attributes" forward into the SB 1122 context.[44]

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[38] California Inventory.
[39] Pub. Util. Code § 399.12(h)(2).
[40] *See* D.08-08-028 at pp. 17-29.
[41] D.13-05-034 at p. 44.
[42] Pacific Gas And Electric Company's (U 39-E), Southern California Edison Company's (U 338-E), and San Diego Gas & Electric Company's (U 902-E) Joint Submission of Third Revised Proposed Standard Form Contract for the Section 399.20 Feed-In Tariff Program at p. 44 (filed in R11-05-005 July 18, 2012).
[43] *Id.* at p. 45.
[44] BioMAT Joint Submission, App. B1 at pp. 66-67.

Because bioenergy facilities' stack emissions of greenhouse gases are much higher than those of the fossil-fueled facilities they purportedly replace, the "avoided emissions" conveyed with the REC (avoided fossil emissions) are not sufficient to ensure "zero net emissions." Rather, additional reductions to offset these higher stack emissions must be identified and conveyed to the buyer of the energy. "Treatment benefits" are the only conceivable source of these reductions, to the extent they occur at all. A requirement that BioMAT facilities show net emissions reductions based on a comprehensive and scientifically defensible method of accounting for the greenhouse gas emissions associated with bioenergy generation will resolve this discrepancy and ensure clarity and accuracy in RPS contracting.

B. The proposed net GHG emissions reductions requirement also ensures consistency with the Integrated Resource Plan requirements.

Currently, RPS eligibility does not require any GHG emissions accounting. However, load-serving entities ("LSEs") are required to quantify GHG emissions in other Commission proceedings. LSEs must include detailed information about GHG emissions associated with "all of the emitting resources used to serve their load, including system power," in their IRPs.[45]

Although quantifying net GHG emissions reductions is considerably more involved than quantifying emissions from the stack, a customized calculator would greatly reduce any additional computational burden. Thus, the Commission's proposal would ensure consistency not only with the purpose of the RPS but also with IRP requirements, without undue burden.

C. The proposed net GHG emissions reductions requirement ensures consistency with SB 100, SB 901, and SB 350.

Pursuant to SB 100, "It is the policy of the state that eligible renewable energy resources and zero-carbon resources supply 100 percent of all retail sales of electricity" and electricity procured by state agencies by 2045.[46] Commission "shall incorporate this policy into *all* relevant planning."[47] As discussed in depth above, bioenergy generation can produce more GHGs than fossil fuel generation. The Commission has acknowledged as much in its Staff Proposal. The Commission's proposal to require net GHG emissions reductions is necessary to comply with SB 100's mandate that all agencies incorporate the state's zero-carbon goals into all relevant planning. Without this requirement, the BioMAT seriously undermines California's ability to meet SB 100's goals.

Similarly, SB 350 requires LSEs to meet "greenhouse gas emissions reductions targets" that reflect "the electricity sector's percentage in achieving the economy-wide greenhouse gas emissions reductions of 40 percent from 1990 levels by 2030."[48] LSEs cannot meet these targets if carbon-intensive fuels like woody biomass replace zero-carbon energy sources or even fossil fuel generation.

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[45] D.18-02-018, Decision Setting Requirements for Load Serving Entities Filing Integrated Resource Plans, Rulemaking 16-02-007, at p. 68 (Feb. 13, 2018)
[46] Cal. Pub. Util. Code § 454.53(a).
[47] *Id.* (emphasis added).
[48] Cal. Pub. Util. Code § 454.52(a)(1)(A).

In addition, SB 901 (Dodd, 2018) requires the California Air Resources Board to develop a standardized approach to quantifying the direct carbon emissions and decay from fuel reduction activities, and quantify the emissions attributed to wildfire statewide. The proposed BioMAT revision would be consistent with SB 901.

a. ***Would you support a proposal requiring that in order to be eligible for BioMAT, a project must demonstrate that it will result in net GHG emissions reductions based on the GHG quantification methodologies and accompanying calculator tools developed by CARB that are discussed on pages 12-13, or a customized calculator tool developed by the CPUC? Please explain.***

We recommend that the Commission create its own customized GHG net emissions calculator in consultation with an independent entity. The Commission should use a GHG emissions reductions quantification methodology that relies on accurate, feedstock-specific calculations that reflect both the quantity and timescale of relevant emissions. In addition, the methodology must include full life-cycle analyses in order to accurately assess the GHG implications of burning any particular feedstock for energy.[49] None of the quantification methodologies or calculator tools developed by CARB and discussed on page 12-13 of the Staff Proposal appropriately assess emissions or emissions reductions associated with biomass generation. *As such, the Commission should develop its own customized calculator. The calculator should:*

(1) Rely on **feedstock-specific calculations**;

(2) Compare the emissions of bioenergy generation to the emissions of the possible **alternative fates of the biogenic feedstock material** if not used for energy generation (e.g., if used as a woody product or simply left to decompose in the forest);

(3) Use **a timeframe analysis** that is meaningful for climate change mitigation, meaning timeframes for evaluating cumulative net emissions consistent with California's short-term and long-term emissions goals (e.g., 2020, 2025, 2030, 2035, 2040, 2045, 2050);

(4) Conduct a **lifecycle emissions analysis** from both the smokestack *and* the processing, transport, and storage of the feedstock;

(5) Utilize a stand-level modeling approach aggregated to the fuel-shed level that uses regionally appropriate, feedstock-specific calculations. In other words, use sequential analysis that accumulates the effect of harvesting and regrowth of individual plots over

[49] *See generally* Timothy D. Searchinger, et al., *Fixing a Critical Climate Accounting Error*, Vol. 326 Science 527 (2009); see also Stephen R. Mitchell et al., *Carbon debt and carbon sequestration parity in forest bioenergy production*, GCB Bioenergy at p. 9 ("Mitchell 2012") (2012), doi: 10.1111/j.1757-1707.2012.01173.x (concluding that management of forests for maximum carbon sequestration provides straightforward and predictable benefits, while managing forests for bioenergy production requires careful consideration to avoid a net release of carbon to the atmosphere).

time and makes clear that each plot is "responsible" for re-sequestering equivalent carbon that was released when that plot was cut;

(6) Consider **leakage** (i.e. carbon emissions or sequestrations that occur outside of the feedstock production boundary but can be attributed to the biogenic feedstock production activities); and

(7) Avoid repeating critical **errors made by the CAL FIRE forest health calculator** that is currently used to calculate GHG "benefits" of bioenergy, as discussed below.

Below, we provide additional detail on each of calculator components.

Feedstock-Specific Calculations: Bioenergy feedstocks (e.g., residue or whole tree) have variable GHG emissions profiles. An emissions reductions analysis should take the type of feedstock used and source region into account.

Alternative Fates Analysis: Instantaneous emissions from bioenergy are simply stack emissions, but the actual emissions from bioenergy reasonably include additional lifecycle emissions, such as fossil emissions from harvest and transport, and biogenic emissions from biomass cut but not recovered during harvesting. Thus, to produce a "reduction" in emissions requires assuming that some emissions are offset over time—either by forest regrowth or by the assumption that emissions from a counterfactual fate (such as pile burning or on-site decomposition) would occur anyway.

In order to calculate the GHG emissions associated with any particular bioenergy it is essential to develop accurate baselines and emissions factors for the different alternative fates of that feedstock. Accordingly, bioenergy GHG emissions must be compared to emissions that otherwise would have occurred if the material were not used as fuel. An alternative fates analysis is prospective in nature and will most likely require an anticipated baseline.[50] An anticipated baseline requires selecting a time period and determining what would have happened anyway without the harvesting and comparing that impact with the carbon trajectory associated with harvesting of biomass for bioenergy.

The Timeframe of Analysis: Bioenergy converts stored carbon to CO_2 instantaneously, while future resequestration or avoided decomposition may take years, decades, or even centuries to achieve atmospheric parity. Multiple studies have shown that it can several decades to discharge the "carbon debt" associated with bioenergy production, even where "waste" materials like

[50] SAB Review at p. 32.

timber harvest residuals are used for fuel.[51] Where forests are harvested specifically for fuel, it can be decades to centuries before the bioenergy system realizes a net carbon benefit (depending on harvest intensity, frequency, and forest characteristics).[52] One study, using realistic assumptions about initially increased and subsequently repeated bioenergy harvests of woody biomass, concluded that the resulting atmospheric emissions increase may even be permanent.[53]

It is not enough merely to postulate that biomass generation may become "carbon neutral" at some point in the future. Rather, emissions over time must be assessed in relation to California's short- and long-term emissions reduction goals. Net emissions reductions should be assessed over a five- or ten-year timeframe, e.g. 2020, 2025, 2030, 2035, 2040, 2045, and 2050.

Lifecycle Emissions Analysis: The reductions analysis should not only assess emissions from the stack but also emissions from the transport, processing, and storage of feedstock. Harvesting and processing of wood products for biomass results in substantial CO_2 emissions.[54] Some feedstock decays during storage,[55] which also results in CO_2 emissions, but more importantly, wood chip piles and even dried wood pellets have been shown to sometimes be large sources of methane.[56] Other feedstock is lost during transportation and handling; this biogenic carbon will also eventually enter the atmosphere, although not at the stack.

Leakage: Bioenergy can have carbon impacts outside of the feedstock source region. For example, an increased market for bioenergy could incentivize changes in land management, e.g. managing a previously unmanaged forest. These indirect land use changes attributable to feedstock production can have significant emissions implications.

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[51] *See, e.g.*, Mitchell 2012; Ernst-Detlef Schulze et al., *Large-scale Bioenergy from Additional Harvest of Forest Biomass is Neither Sustainable nor Greenhouse Gas Neutral*, GCB Bioenergy at p. 1-2 (2012), doi:10.1111/j.1757-1707.2012.01169.x; Jon McKechnie et al., *Forest Bioenergy or Forest Carbon? Assessing Trade-Offs in Greenhouse Gas Mitigation with Wood-Based Fuels*, Vol. 45Env't Sci. Tech. 789 (2011); Anna Repo, et al., *Indirect Carbon Dioxide Emissions from Producing Bioenergy from Forest Harvest Residues*, Global Change Biology BIOENERGY (2010) ("Repo 2010"), doi: 10.1111/j.1757-1707.2010.01065.x; John Gunn et al., *Manomet Center for Conservation Sciences, Massachusetts Biomass Sustainability and Carbon Policy Study* (June 2010), *available at* https://www.manomet.org/wp-content/uploads/old-files/Manomet_Biomass_Report_ExecutiveSummary_June2010.pdf .

[52] Timothy D. Searchinger, et al., *Fixing a Critical Climate Accounting Error*, Vol. 326 Science 527 (2009); Tara Hudiburg et al., *Regional carbon dioxide implications of forest bioenergy production*, Vol. 1 Nature Climate Change 419 (2011), doi:10.1038/NCLIMATE1264; John L. Campbell et al., *Can fuel-reduction treatments really increase forest carbon storage in the western US by reducing future fire emissions*?, Vol. 10 Frontiers in Ecology and the Env't 83-90 (2011), doi:10.1890/110057; Mitchell 2012.

[53] Bjart Holtsmark, *The Outcome Is in the Assumptions: Analyzing the Effects on Atmospheric CO2 Levels of Increased Use of Bioenergy From Forest Biomass*, GCB Bioenergy (2012), doi: 10.1111/gcbb.12015.

[54] Mark E. Harmon, et al., *Modeling Carbon Stores in Oregon and Washington Forest Products: 1900-1992*, Vol. 33 Climatic Change 521, 546 (1996) (concluding that 40-60% of carbon in harvested wood is "lost to the atmosphere . . . within a few years of harvest" during wood products manufacturing process).

[55] SAB Review at 19.

[56] Mirjam Röder, et al.., *How certain are greenhouse gas reductions from bioenergy? Life cycle assessment and uncertainty analysis of wood pellet-to-electricity supply chains from forest residues*, Vol. 79 Biomass and Bioenergy 50 (2015).

Issues with the CAL FIRE model: The Commission asks whether showing net emissions reductions from bioenergy projects should be conducted using CARB's methodology and calculator tools, or a customized calculator to be developed by CPUC. We believe that the CAL FIRE model has significant problems that fundamentally undermine its ability to produce a scientifically defensible estimate of net emissions. While this calculator has elements that are useful, we believe the problems are extensive enough that a new calculator should be developed by the Commission in consultation with an independent entity. We detail the issues with the CAL FIRE model below.

The CAL FIRE model calculates the net GHG "benefit" of bioenergy as:

Net GHG Benefit = <u>Carbon stored long-term in wood products</u> + <u>avoided emissions from fossil fuel-based energy displaced by biomass energy</u> – <u>stationary combustion emissions from biomass energy production</u> + <u>avoided emissions from alternative form of biomass disposal</u>

There are several problems with this calculation.

1. CPUC needs an estimate of net emissions to determine the atmospheric impact of biomass energy (preferably expressed in units of lb CO_2 per MWh). However, the CAL FIRE model is set up to determine a "benefit" from burning biomass – an amorphous term that is hard to quantify (and which demonstrates the bias of the model).
2. Because the CAL FIRE model is set up to calculate a benefit instead of emissions, the equation treats stationary combustion emissions from burning biomass as a negative term, and avoided emissions from the alternative fate of biomass as a positive term. This is backwards.
3. The equation starts by assigning the carbon stored in long-lived wood products to bioenergy. We are not aware of any other model of bioenergy emissions that does this. Unless the sole reason for long-lived wood products to exist is that biomass fuel harvesting occurs – which seems extremely unlikely – these terms should be decoupled.
4. The equation includes avoided fossil emissions. While it is legitimate to compare bioenergy CO_2 impacts with fossil fuel impacts, this term should not be "baked in" to the calculation of net emissions. It is no more legitimate to do this than it would be to calculate "net" emissions for a gas plant by subtracting out avoided coal emissions. The "avoided fossil emissions" should also be replaced by a realistic grid average that reflects generation from low- and zero-emissions sources.

Net emissions are accurately calculated by subtracting the cumulative emissions from the alternative fate for biomass from its cumulative combustion emissions (and lifecycle emissions, if appropriate). This generates an estimate of the additional CO_2 that is emitted by burning the biomass rather than letting it undergo an alternative fate. This net estimate can be properly compared to current fossil emissions, or more correctly, the grid average.

Correct: Net emissions = [biomass combustion] – [biomass alternative fate]

This is the additional emissions impact of choosing to burn biomass as fuel. This value can *then* be legitimately compared to the fossil comparator (or preferably, grid average) to ask,"will bringing this biomass unit online increase or decrease the average emissions per unit energy."

> **Incorrect:** Net emissions = [biomass combustion] – [biomass alternative fate] – [grid avg.]

Since the grid average emissions rate has already been subtracted out in the calculation of net emissions, it is not legitimate to then compare net emissions to the grid average. The only thing one can do with this form of the equation is conclude that if the value of net emissions is negative, then bioenergy has a lower carbon impact than the grid average; if the value is positive, then bioenergy has a higher carbon impact.

Problems with CAL FIRE counterfactual emissions estimates

It is essential that net emissions be calculated correctly. The calculation of net emissions involves subtracting "counterfactual" emissions – the GHG's that would be emitted if the biomass was not burned – from emissions when it is burned. This is the correct approach. However, the CAL FIRE model currently being used to estimate emissions, and which CPUC is considering using, contains significant errors in its use of the counterfactual approach that lead to inaccurate estimates of net bioenergy emissions.

CAL FIRE issues related to appropriate timeframes for calculating net emissions

Calculating net emissions requires comparing the cumulative emissions from the bioenergy scenario and the counterfactual scenarios over some specified timeframe. It appears that the CAL FIRE modeling calculates project carbon impacts over a 50-80 year timeframe. This is clearly inadequate to address climate change, given the very short timeframe specified by the IPCC as required for dramatic emissions reductions. The emissive nature of bioenergy, and its incompatibility with climate change mitigation, has been noted by the European Academies Science Advisory Council, who say regarding bioenergy,

> "The proximity of current levels of warming to the 1.5 °C Paris targets requires that only projects whose payback periods are of the order of a decade or less should be regarded as 'renewable energy'".[57]

CAL FIRE emission factors overestimate counterfactual emissions

The CAL FIRE model also uses inaccurate, unsourced estimates for counterfactual emissions (the "avoided emissions from alternative form of biomass disposal" term in the equation). The tab labeled "ERFs" in the CAL FIRE spreadsheet model contains emission factors for the

[57] *Commentary by the European Academies' Science Advisory Council (EASAC) on Forest Bioenergy and Carbon Neutrality,* EASAC (June 15, 2018) *available at* https://easac.eu/fileadmin/PDF_s/reports_statements/Carbon_Neutrality/EASAC_commentary_on_Carbon_Neutrality_15_June_2018.pdf.

different counterfactual scenarios for biomass if it is not collected and burned for energy. Units are tons CO_2-equivalent per bone-dry ton of biomass.

There are three main alternative fates for biomass, as shown in the chart below.

Avoided Open Pile Burn Emissions (ton CO2e/BDT)	0.16	Placer County Air Pollution Control District, Biomass Waste for Energy Project Reporting Protocol (January 2013) http://www.placer.ca.gov/~media/apc/documents/apcd biomass/biomasswasteforenergyproject.pdf
Avoided landfill emissions (MT CO_2e/short ton)	0.21	California Air Resources Board, Draft Method for Estimating Greenhouse Gas Emission Reductions from Diversion of Organic Waste from Landfills to Compost Facilities (March 2016) https://www.arb.ca.gov/cc/waste/waste.htm
Avoided on-site decay emissions (ton CO2e/BDT)	1.25	Placer County Air Pollution Control District, Biomass Waste for Energy Project Reporting Protocol (January 2013) http://www.placer.ca.gov/~/media/apc/documents/apcd biomass/biomasswasteforenergyproject.pdf

A major, if not the primary, alternative fate for forestry residues collected as biomass fuel is to be left on-site to decompose. The model cites the "Placer County Air Pollution Control District, Biomass Waste for Energy Project Reporting Protocol"[58] as the source for an emission factor of 1.25 tons of CO_2e that would be emitted by decomposition if the biomass is not burned for energy. That protocol contains the following equation at p. 14:

$$GHG_{DD} = EF_{DD,\,CH4} * BM_{DD} * 21 + EF_{DD,\,N2O} * BM_{DD} * 310 \qquad \text{(Eq. 14)}$$

GHG_{DD} Greenhouse gas emissions from field decay and decomposition, as CO_2 equivalent (tons CO_{2e})

EF_{DD} Emission factor for CH_4 and N_2O from in-field decay and decomposition of biomass. Recommend the use of 0.05 ton CH_4 / ton dry biomass. Recommend the use of 0 tons N_2O / ton dry biomass.

This system of equations is flawed. In real life, the main product of decomposition is CO_2. However, the decay equation above does not even contain an emission factor for CO_2; it apparently assumes that 100% of the carbon lost during decay is lost as methane (CH_4). There is no basis for this assumption. In fact, CH_4 is only produced by microbes in extremely anoxic conditions, such as wetlands, and oxygen is actually toxic to methanogenic microbes. Since

[58] Placer County Air Pollution Control District, Biomass Waste for Energy Project Reporting Protocol (Jan. 2013) http://www.placer.ca.gov/~/media/apc/documents/apcd biomass/biomasswasteforenergyproject.pdf .

logging residues decomposing in the forests generally do not lack for oxygen, CH_4 production is generally extremely low, and in many cases, forest soils can act as net sinks for methane.

Although the value calculated for decay emissions of methane in the biomass waste protocol is incorrect, it is still interesting to note that the value used in the CAL FIRE model does not match the value in the cited document. Equation 14 above multiplies the emission factor for CH_4 by 21, the outdated global warming potential of CH_4 from the IPCC Second Assessment Report. The resulting value of 0.05 x 21 equals 1.05. Thus it is not clear why the CAL FIRE model recommends an estimate of 1.25 tons of CO_2e per ton of bone dry biomass. There is no citation for where the extra 0.2 tons of CO_2e comes from in the CAL FIRE model.

Returning to the CAL FIRE equation for the net "benefit" of bioenergy, above, another problem that needs to be addressed is its failure to include a term for what *is* an actual source of methane: the large fuel chip piles that exist at most biomass facilities. Unlike forestry residues decomposing on-site, fuel chip piles can become anoxic, leading to evolution of significant amounts of methane.[59] Methane evolution has also been observed for finished wood pellets, although the mechanism of production may be abiotic.[60]

CAL FIRE calculations regarding the effects of avoided fire

The CAL FIRE model is specialized in calculating GHG emissions benefits of fuels removals projects. We do not know what resources the model used as documentation for the values selected regarding fire-related thinning, but given that the value used to calculate avoided emissions from decomposition was completely unsourced and unjustified, and given that the parts of the CAL FIRE model we have examined seem expressly set up to calculate a "benefit" from bioenergy, CPUC should be cautious about the conclusions of the model regarding fuels removals.

b. Are there other established emissions quantification tools or methodologies that the Commission should consider to establish that BioMAT projects will result in net emission reductions? Please explain.

The Commission has asked for input on other models that might be considered for estimating net emissions. There are a variety of models that exist, but few take into account the "benefits" of thinning for fire removal. If the Commission elects to develop another model, we advise that it

[59] Staffan Melin, *Safety in handling wood pellets. Summary of the proceedings of BioEnergy Conference and Exhibition 2008*. Prince George, BC, Canadian Bioeconomy Conference and Exhibition (2008); J.A.Micales and K.E.Skog, *The decomposition of forest products in landfills*, Vol. 39(2) International Biodeterioration & Biodegradation 39(2) 145(1997); Mirjam Röder et al., *How certain are greenhouse gas reductions from bioenergy? Life cycle assessment and uncertainty analysis of wood pellet-to-electricity supply chains from forest residues*, Vol. 79 Biomass and Bioenergy 50 (2015).

[60] Esa Alakoski et al., *From wood pellets to wood chips, risks of degradation and emissions from the storage of woody biomass – A short review*, Vol. 54 Renewable and Sustainable Energy Reviews 376 (2016).

look for a truly independent source, rather than turning to tools produced by another agency (such as CAL FIRE).

19. Are there additional actions the Commission should take to address program barriers and expand program participation? Please explain your proposal(s) and provide rationale.

As discussed above, California's climate goals pose a barrier to BioMAT participation. In addition, the National Ambient Air Quality Standards ("NAAQS") present a barrier to the increase in biomass generation BioMAT program contemplates. Many of the BioMAT facilities are or will be located in areas that are in nonattainment of the NAAQS and consequently must adhere to stringent emissions limits on criteria pollutants such as ozone, sulfur dioxide, and nitrogen oxide. However, biomass generation facilities emit large quantities of these pollutants; therefore, it may not be feasible to operate these facilities in the locations for which they are planned.

20. Do you anticipate any challenges transitioning from the existing BioMAT program to a program that incorporates any of the changes under consideration? Explain the challenge(s) and provide a proposal to address the challenge(s).

A BioMAT program that does not require a showing of net GHG reductions seriously undermines the state's ability to meet its short- and long-term climate goals. In addition, absent this requirement, the BioMAT poses unfair costs on ratepayers. Ratepayers will have to pay once to subsidize expensive bioenergy facilities and again when dealing with the consequent impacts of climate change and mismanaged forests. Therefore, it is critical that Commission adopt a requirement that projects show net GHG reductions in order to be eligible for BioMAT, regardless of any challenges such a requirement might pose.

In conclusion, the Environmental Groups urge the Commission to revise the BioMAT so that contracts are only awarded to projects that reduce identified risks and produce environmental benefits, and not expanded to shore up projects with greater ratepayer costs than benefits.

Respectfully,

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