DOCKETED	
Docket Number:	21-ESR-01
Project Title:	Energy System Reliability
TN #:	247839
Document Title:	Bioenergy Association of California Comments
Description:	N/A
Filer:	System
Organization:	Bioenergy Association of California
Submitter Role:	Public
Submission Date:	11/30/2022 2:42:49 PM
Docketed Date:	11/30/2022

Comment Received From: Bioenergy Association of California
Submitted On: 11/30/2022
Docket Number: 21-ESR-01

BAC Comments on 21-ESR-01

Additional submitted attachment is included below.

November 30, 2022

Mr. David Erne, Supervisor
Energy Systems Research Office
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

Re: <u>Comments on RFI – Clean Energy Resources for Reliability (21-ESR-01)</u>

Dear Mr. Erne:

The Bioenergy Association of California (BAC) submits these comments on the CEC's Request for Information (RFI) on Clean Resources for Reliability. BAC supports the Commission's focus on clean energy resources and reliability, both of which are essential to meet the state's climate change and air quality goals. BAC's answers to the specific questions posed in the RFI are below, but BAC also recommends establishing over-arching priorities, which are to:

- Prioritize the resources that provide the greatest climate benefits, including the reduction of Short-Lived Climate Pollutants and carbon negative resources;
- Prioritize clean firm resources as the most critical for reliability purposes;
- Prioritize resources that mitigate wildfires that threaten reliability, emit climate and air pollution, and cost ratepayers billions of dollars.

BAC represents more than 100 members that are working to convert organic waste to energy to meet the state's climate, clean energy, waste reduction, wildfire reduction, and air quality goals. BAC's public sector members include cities and counties, environmental and air quality agencies, waste and wastewater agencies, research institutions, a publicly owned utility, and non-profit environmental and community groups. BAC's private sector members include developers, technology providers, investors, an investor owned utility, agriculture and food processing companies, waste haulers, consulting firms, and more.

BAC submits the following information in response to the Commission's RFI.

1. **The Highest Climate Priority Between Now and 2035 is the Reduction of Short-Lived Climate Pollutants.**

Climate scientists agree that reducing Short-Lived Climate Pollutants (SLCPs) is the most urgent step we can take to protect the climate since it is the only one that begins to reverse climate change right away and at scale. Climate experts around the state underscored this in a recent study that found reducing carbon dioxide emissions "while essential, will take two to three decades to have an impact on the steeply warming curve."[1] That is why climate scientists consider SLCP reductions to be the last lever we have left to avoid catastrophic climate change.[2]

As the Air Board's *Short-Lived Climate Pollutant Reduction Strategy* states, "The science unequivocally underscores the need to immediately reduce emissions of short-lived climate pollutants (SLCPs)."[3] The *Draft 2022 Climate Change Scoping Plan* also notes the urgency of reducing SLCPs, stating that "[g]iven the urgency of climate change . . . efforts to reduce short-lived climate pollutants are especially important"[4] and that "efforts to reduce short-lived climate pollutants emissions can provide outsized climate and health benefits."[5]

SLCP reductions, unlike reductions in carbon dioxide emissions, provide immediate and significant public health benefits.[6] Black carbon and methane are both air pollutants that impact air quality and public health significantly. As the *Draft climate Change Scoping Plan* notes, every million metric tons of avoided methane saves 1,430 premature deaths.[7] Black carbon, also known as particulate matter, is even worse for public health and also impacts agricultural productivity, forest health, and precipitation patterns. In other words, not only is SLCP reduction more critical for the climate than other carbon reductions, but it also provides more immediate benefits to public health and the economy than carbon dioxide reductions.

For all these reasons, BAC urges the CEC to prioritize SLCP reductions by investing in advanced technology projects that convert organic waste to energy since organic waste causes 87 percent of California's methane emissions and more than 90 percent of its black carbon emissions.[8]

The Commission should also prioritize resources that can provide carbon negative emissions, which will be essential to achieve carbon neutrality. The California Air

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[1] Kammen, Ramanthan, Matlock, et al, "*Accelerating the Timeline for Climate Action in California,*" submitted to Environmental Research Letters, 2021. Available at: https://arxiv.org/abs/2103.07801 [arxiv.org].

[2] Id. See, also, Kammen, Ramanthan, Matlock, et al, footnote 2 above.

[3] *Short-Lived Climate Pollutant Reduction Strategy*, adopted by the California Air Resources Board, March 2017, at page 1.

[4] Id. at page 22.

[5] Id.

[6] Id.

[7] *Draft 2022 Climate Change Scoping Plan*, page 180.

[8] *2022 Climate Change Scoping Plan for Achieving Carbon Neutrality*, issued by the California Air Resources Board on November 15, 2022.

Resources Board (CARB) study on achieving carbon neutrality, the *2022 Climate Change Scoping Plan*, and a report by Lawrence Livermore National Lab on how to achieve carbon neutrality all point to the need for carbon negative emissions to offset emissions that cannot be eliminated by 2045. According to Lawrence Livermore National Lab, California will need 125 million metric tons of negative emissions to achieve carbon neutrality and bioenergy with carbon capture and storage (BECCS) can provide two-thirds of all the carbon negative emissions needed.[9]

Energy generated from organic waste – including hydrogen, biogas and biomethane - is the only form of energy that can provide carbon negative emissions. Since those emissions are essential to reach the state's goal of carbon neutrality, the Commission should prioritize resources that provide carbon negative emissions.

2. The Highest Energy Priority is Clean, Firm Power.

The Commission's modeling for SB 100 found that California will need up to 15,000 megawatts of clean firm power to maintain reliability while achieving 100 percent renewable and zero carbon power.[10] As the *2021 Integrated Energy Policy Report* noted, "the intermittency of solar and wind resources necessitates flexible or dispatchable resources that can quickly come on-line when the sun sets or winds stop blowing."[11]

More recent reports have found that California will need closer to 30,000 megawatts of clean firm power to maintain reliability,[12] especially if California needs to triple electricity generation, as projected in the *2022 Climate Change Scoping Plan* to enable building and transportation electrification.

Increasing clean firm power will also lower power system costs overall. A recent study in *Energy and Climate Change* found that including a diverse portfolio of firm, renewable resources would reduce overall system costs substantially - even if the individual resource costs are higher per MWh.[13] As Environmental Defense Fund explained:

> "California needs a significant amount of clean firm power to meet its decarbonization targets while keeping rates affordable. Failing to procure clean firm power will require a massive overbuild of solar and wind that will increase rates by

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[9] Id.

[10] California Energy Commission, *2021 Integrated Energy Policy Report*, Volume III, at page 72.

[11] California Energy Commission, *2021 Integrated Energy Policy Report*, Volume III, at page 24.

[12] Jane C.S. Long, et al, "Clean Firm Power is the Key to California's Carbon-Free Energy Future," published March 24, 2021 in *Issues in Science and Technology.*

[13] E. Baik, et al, "What is different about different net-zero carbon electricity systems?" published in *Energy and Climate Change* 2 (2021) 100046, July 2021.

about 65 percent in 2045; by contrast, using clean firm power California could keep rates similar to those found today."[14]

The Commission should prioritize firm, renewable resources for reliability and cost containment.

3. The Commission Should Prioritize Resources that Mitigate the State's Wildfire Crisis.

Wildfire presents an unprecedented threat to electricity reliability and costs, as well as public health and safety. Wildfires have caused ratepayers tens of billions of dollars in recent years due to direct damages caused by wildfires sparked by electricity infrastructure and operations. The costs to harden electricity will also be enormous and will never fully mitigate wildfire risks. In addition, wildfires emit huge amounts of climate and air pollution. A recent study by UCLA found that the 2030 fire season alone emitted as much carbon as California has reduced across all sectors of the economy over the past 20 years. In other words, wildfire emissions wiped out 20 years of progress in reducing carbon emissions.[15]

Wildfires also pose huge risks to reliability. To reduce the risk of causing wildfires, the utilities have implemented Public Safety Power Shutoffs on numerous occasions. Wildfires in the Sierras or in neighboring states also threaten transmission of out of state power, putting more strain on California's instate supplies and power grid. And wildfires jeopardize hydropower supplies by impacting forests, erosion and sedimentation in reservoirs, precipitation patterns, and more. Finally, the communities that are most at risk of wildfires and PSPS events are the rural, forested communities that also tend to have the oldest, most vulnerable infrastructure.

According to the *California Forest Carbon Plan*, adopted by CalEPA and the California Natural Resources Agency, California cannot meet its climate goals without reducing wildfire emissions.[16] California also cannot maintain reliable electricity supplies without reducing the risk and severity of wildfires. As a result, the *2022 Climate Change Scoping Plan* calls for forest thinning on 2.3 million acres annually, which will generate 8 to 15 million tons of forest waste.[17] Converting that forest waste to energy would reduce the need for open burning, helping to slash climate and air pollution. According to the *California Forest Carbon Plan,* converting that forest waste to energy cuts

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[14] Comments of Environmental Defense Fund on the 2021 Preferred System Plan Ruling, filed in R.20-05-003 on September 27, 2021, at page 2.

[15] Michael Jerret, et al, "Up in Smoke: California's Greenhouse Gas Reductions Could be Wiped Out by 2020 Wildfires*,"* published in *Environmental Pollution* 310 (2022) 119888. Available at: https://www.sciencedirect.com/science/article/pii/S0269749122011022#:~:text=In%20this%20short%20communication%2C%20we,GHG)%20emission%20reductions%20since%202003.

[16] *California Forest Carbon Plan*, adopted by CalEPA, CNRA, and CalFire in May, 2018, at page 2.

[17] *2022 Climate Change Scoping Plan for Achieving Carbon Neutrality*, issued by the California Air Resources Board on November 15, 2022, at page 99.

methane and black carbon emissions by 98 percent compared to pile and burn or controlled burns of forest waste.[18] Converting that waste to energy will also provide a source of firm power in the communities that are most vulnerable to grid disruptions. And, if combined with carbon capture and storage, it would provide carbon negative emissions.

The CEC should prioritize resources that mitigate wildfires given that wildfire emissions now dwarf the state's carbon reduction efforts and threaten energy reliability. Supporting bioenergy generated from forest biomass waste will help mitigate the wildfire crisis while providing firm renewable power in the communities that are most vulnerable to fires and to PSPS events.

4. Answers to Specific Questions in the RFI

BAC's responses to the specific questions posed in the RFI are below.

A. Resource Types and Evaluation Attributes

<u>Questions 1-3:</u> Table 1-3 are missing several important resource types and attributes:

- Table 1, Renewables – should include bioenergy in all forms (biomass, biogas, bio-syngas, hydrogen from organic waste, combined heat and power, thermal heat only) and should include renewable hydrogen in all forms.
- Table1, Storage – should include renewable gas (biogas, biomethane, hydrogen) as forms of long duration storage.
- Table 1, Gas Fired Generation – should include noncombustion conversion technologies (fuel cells, linear generators) or those should be in their own category of "noncombustion generation"
- Table 3, Distributed Technologies – should include distributed generation using combustion engines (with renewable gas) and linear generators, which provide noncombustion conversion.

<u>Questions 4 and 5 – Weighting of Attributes and Additional Information Needed</u>

BAC urges the CEC to weigh "dispatchability" and "cleanliness" as the two most important attributes and to divide the cleanliness attribute into two separate categories – lifecycle carbon intensity and criteria air pollutant emissions.

Dispatchability is critical for reliability and dispatchable power is by far the most valuable form of power because it can firm and shape intermittent renewables. It is also the form of renewable power that has experienced the least growth in the past decade, so the state needs to adopt additional incentives or requirements to accelerate growth in clean, dispatchable power. Nothing is more critical to maintain reliability than rapidly increasing the generation of clean, dispatchable power.

[18] *California Forest Carbon Plan* at pages 130, 135.

As for the “cleanliness” attribute, it should be divided into two separate attributes: lifecycle carbon intensity and criteria air pollutant emissions. There is not a consistent correlation between these two aspects of “cleanliness” so they should be considered separately. For example, distributed solar or wind power has zero air pollution emissions at the point of energy production, but lifecycle carbon intensities that are slightly positive (due to raw materials, manufacturing, land use changes, disposal of materials at end of life, etc.). By contrast, biogas and hydrogen generated from organic waste can have carbon negative emissions on a lifecycle basis, but may emit some air pollution depending on which conversion and generation technologies are used.

BAC encourages the CEC to drop the permitting timeline and supply chain issues from the list of attributes to be considered. Both of these are highly variable and likely to change over the next 10 to 15 years. For example, large solar installations took many years to permit in the first few years after the RPS was enacted, but go much more quickly now. The state can also take steps to accelerate permitting for eligible resources, so this should not be a significant attribute for purposes of multi-year planning purposes. Similarly, supply chain issues vary enormously from year to year and should not be included as a factor in longer term planning as they are impossible to predict with any accuracy.

B. Resource Characterization

BAC’s answers to the Resource Characterization questions focus on instate bioenergy generation.

<u>Questions 1, 3 and 4 – Resource Overview and Potential Production</u>

Bioenergy - including biomethane, biogas and hydrogen generated from organic waste – can provide clean, firm power with low carbon or even carbon negative emissions. While most bioenergy is used to generate baseload power, it can be used to generate dispatchable power instead by converting organic waste to biogas or hydrogen. Renewable gas from organic waste can also provide long duration energy storage. In other words, bioenergy can provide two of the most important forms of energy needed for reliability, dispatchable power and long duration storage.

Table 1, below, shows the potential for bioenergy generated from technically available organic waste, based on data from UC Davis (presented in the *2017 IEPR*) and Lawrence Livermore National Lab. This does not include purpose grown crops, algae, or the non-organic fraction of landfill waste. It also does not include forest biomass removed for the sake of energy, nor does it reflect the Air Board’s goal in the *2022 Climate Change Scoping Plan* of forest thinning on 2.3 million acres annually, which will generate significant additional forest waste biomass.

California generates enough technically available organic waste annually, as shown in Table 1 below, to generate thousands of megawatts of firm, renewable power. This is the only form of renewable power that reduces Short-Lived Climate Pollutants from organic waste (the cause of most SLCP emissions in California) and the only form of renewable power that can be carbon negative. At present, California is using about 15 to 20 percent of its total bioenergy potential, so there is enormous room for growth in this sector.

TABLE 1

California's Renewable Gas Potential from Organic Waste

Feedstock	Amount Technically Available	Billion Cubic Feet Methane	Million Gasoline Gallon Equivalents	Tons of Hydrogen (assuming 85% conversion efficiency)
Landfill Gas	106 BCF	53	457	
Animal Manure	3.4 M BDT	19.5	168	
Wastewater Treatment Gas	11.8 BCF	7.7	66	
Fats, Oils and Greases	207,000 tons	1.9	16	
Municipal Solid Waste (food, leaves, grass)	1.2 M BDT	12.7	109	
Municipal Solid Waste lignocellulosic fraction)	6.7 M BDT	65.9	568	
Agricultural Residue (Lignocellulosic)	5.3 M BDT	51.8	446	
Forest, Sawmill, Shrub & Chaparral Residues	26.2 M BDT	256	2,214	
BIOGAS POTENTIAL		**468.5**	**4,044**	**4,038,793**

Source: Rob Williams and Stephen Kaffka, UC Davis, presentation to the California Energy Commission on 1/30/17; Lawrence Livermore National Lab assessment of forest, sawmill, shrub & chaparral residues, Jan2020

Question 2 – Emissions Profile

Table 2, below, shows sample carbon intensities for several forms of bioenergy compared to other resources under the Low Carbon Fuel Standard. While emissions from electricity generation will vary somewhat from transportation fuels, the relative emissions values should be quite similar. As Table 2 shows, the lifecycle carbon emissions from bioenergy can be many times lower than any other resource and are, in many cases, carbon negative.

TABLE 2 – Examples of Lifecycle Carbon Intensities

Lifecycle Carbon Intensity (grams CO_2e / MJ)

Diesel	102
Gasoline	100
Corn ethanol	34-75
Natural Gas	70
Fuel Cell (non-renewable hydrogen)	39
Electric vehicles (CA power grid)	31
Biodiesel	9 to 50
Landfill Biogas	11 to 40
Biogas from forest waste	14
Wastewater Biogas (large facilities)	8 - 30
Biogas from Diverted Food and Green Waste	-15 to -180
Dairy Biogas	-350

www.arb.ca.gov/fuels/lcfs/lcfs.htm

Question 5 – Levelized Costs

BAC urges the Commission to consider not just the cost per MWh, but the cost per ton of carbon reduction. The goal of transforming California's power sector is to decarbonize the state's energy supply. Therefore, the cost per ton of carbon reduction is just as important as the cost per MWh. According to the Air Board's annual report to the Legislature, investments in waste to energy are by far the most cost-effective of all the state's climate investments, reducing carbon for only $9 and $10 per ton for dairy digesters and diverted organic waste projects, respectively.[19] Analysis by the Legislative Analyst's Office reached a similar conclusion: the most cost-effective climate investments the state has made have been investments in dairy digesters, diverted organic waste projects, and projects to promote forest health.[20] According to the LAO report, investment in waste to energy projects cost about one-fifth the average cost of California's climate investments.[21] By contrast, investments in other forms of

[19] California Air Resources Board, *California Climate Investments 2022 Mid-Year Data Update,* September 2022, showing that investments in dairy digesters and diverted organic waste cut carbon emissions for $9 and $10 per ton, respectively. ARB's 2021 Annual Report to the Legislature on California's Climate Investments also showed that investments in organic waste to energy were the most cost-effective of all the state's climate investments. See Table 2, pages 17-18.

[20] California Legislative Analyst's Office, *Estimated Average GHG Reduction Cost Is High With Wide Variation Across Programs,* report to the Legislature, April 2016, at page 2.

[21] Id.

renewable power are much more expensive in terms of the cost per ton of carbon reduction.

When looking at the energy costs alone, the levelized costs of bioenergy vary enormously by feedstock type, conversion technology, end product, application, and proximity to the grid. The least expensive form of bioenergy is landfill gas that is already captured and flared (to convert methane to carbon dioxide). According to the US EPA, California landfills flare 110 billion cubic feet of landfill gas annually. Since that biogas is already generated and captured, it is the least expensive form of bioenergy and can be converted to dispatchable or baseload power at a cost that is comparable to fossil fuel gas.

For other types of bioenergy, the BioMAT program (requiring 250 MW from new, distributed scale bioenergy facilities) represents current prices by feedstock category:

Category 1 - (diverted organic waste, wastewater biogas, food processing waste and co-digestion) - $127.72 per MWh

Category 2 - (dairy waste) - $187.72 per MWh
(other agricultural waste) - $183.72 per MWh

Category 3 - (byproducts of sustainable forestry) - $199.72 per MWh

While these prices are higher than the cost per MWh of solar or wind power, they are not higher than the combined price of solar or wind plus energy storage and are much lower cost than long duration storage.

<u>Questions 6 and 7 – Time to Deploy</u>

The time to permit, construct, and interconnect bioenergy projects varies greatly depending on the type of feedstock and the project location. Generally, although not always, projects in more urban locations have faster development timelines, but all projects are delayed due to interconnection backlogs, both the interconnection studies required to enter the BioMAT queue and the physical interconnection at the end of construction. In addition, projects in rural areas – especially in forested regions of the state – have faced delays due to wildfire risks. And all projects are facing supply chain constraints.

Bioenergy using landfill or wastewater biogas, since those facilities already generate the biogas and are connected to the grid, could be developed in less than one year with the proper incentives in place and fast-track permitting. Other bioenergy projects can take anywhere from two to five years to develop, but could also be accelerated with streamlined permitting and interconnection processes.

<u>Questions 9 and 10 – Barriers to Deployment</u>

The biggest barriers to distributed bioenergy development, in order of importance, are:

- Interconnection delays and cost uncertainties – as noted above, there are delays in interconnection studies and project interconnection after construction. There is also no predictability around costs of interconnection, with final costs often varying by orders of magnitude from initial estimates or other similar projects.
- BioMAT program rules – the BioMAT was supposed to be a simple, fixed price, feed-in tariff, but is far more complicated in its pricing structure, contract terms (which put all the risk on project developers), inelasticity of prices despite inflation and supply chain constraints, division of feedstock categories between the utilities that no longer makes sense, and a program end date that was not required by legislation and which discourages project development.
- Failure to monetize the value of SLCP reductions, carbon negative emissions, avoided wildfires, reduced landfill waste, and benefits to air, water and soil quality.
- Failure to monetize the value of dispatchable or firm renewables.
- Failure to discourage or prohibit diesel backup generators that are cheaper, but far more polluting.
- Failure to accurately compare bioenergy to intermittent renewables plus storage or backup generation, which provides a misleading and inaccurate cost comparison.

Question 11 – Community Impacts and Benefits

In the case of bioenergy, it is very important to consider not just the impacts of bioenergy itself, but to compare those to the alternative fate of the organic waste, which will be landfilling, pile and decay, or pile and burn. The first two alternatives emit methane – in fact, landfills and dairies are the two largest sources of methane in California. The third alternative, pile and burn, emits black carbon. Wildfires and controlled burns of forest and agricultural waste are the largest sources of black carbon statewide. According to the *California Forest Carbon* Plan, adopted by CalEPA and the California Natural Resources Agency, converting forest or agricultural waste to bioenergy cuts black carbon, methane, CO, and particulate matter by 98 percent compared to open burning.[22] So, when looking at bioenergy impacts, it is critical to compare those impacts to what would occur in the absence of bioenergy.

The CPUC, in consultation with ARB, assessed the lifecycle emissions of every form of bioenergy under the BioMAT program and determined that in every feedstock category, bioenergy reduces greenhouse gas emissions compared to the alternative fate. The CPUC has also determined that BioMAT projects using forest waste provide important public safety benefits by helping to reduce wildfire risks and impacts. In addition, the California Department of Food and Agriculture has found that dairy digesters provide significant benefits to air, water, and soil quality compared to open piles of manure.[23]

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[22] "*California Forest Carbon Plan – Managing Our Forest Landscapes in a Changing Climate,*" adopted by the California Environmental Protection Agency, California Natural Resources Agency and CalFire in May 2018, Figure 19, page 135.

[23] https://www.cdfa.ca.gov/oefi/ddrdp/.

In sum, all categories of bioenergy provide direct environmental benefits to the local community by reducing landfilling, pile and decay, or open burning. Bioenergy also provides more jobs than other forms of renewable energy because of ongoing feedstock collection and treatment needs. And bioenergy can provide greater energy reliability than other forms of renewable or distributed generation because bioenergy can provide firm power and long duration storage.

C. Distributed Electricity Backup Assets (DEBA) Program Design

Question 1 – Resource Types and Customers

AB 205, which established the DEBA, requires the program to incentivize "the construction of cleaner and more efficient distributed energy assets" including the deployment of "new zero- or low-emission technologies, including, but not limited to, fuel cells or energy storage, at existing or new facilities." To meet the requirements for "clean" and "zero- or low-emission technologies," BAC urges the Commission to limit the program to renewable feedstocks and advanced technologies. Renewable feedstocks should include RPS eligible organic waste, both biomass that is eligible under Public Resources Code section 40106 and biogas, as well as hydrogen generated from organic waste, biogas, or RPS eligible electricity. Eligible generation technologies should prioritize noncombustion technologies such as fuel cells and linear generators, wherever possible. Emergency and essential services should also be allowed to use clean combustion engines that run on renewable fuels.

The DEBA program should also prioritize resources that generate firm power and long duration storage as those will provide the greatest benefits for reliability during emergencies and other grid disruptions that are the focus of DEBA.

DEBA should also prioritize the most important customers, which are customers that provide emergency and essential services.

Question 2 – Incentives Needed

For distributed bioenergy, the BioMAT provides a good starting point. The current price offerings are listed above and they are clearly not sufficient to accelerate growth in distributed bioenergy since only 50 of the required 250 MW have been procured to date. BioMAT prices were established several years ago and have not increased since then despite double-digit inflation, supply chain constraints, etc. To accelerate distributed bioenergy development and focus it on providing power and energy storage during emergency events, DEBA should offer a price that is at least 25 percent higher than the current BioMAT prices (which are, essentially, for baseload power). DEBA should include additional incentives for projects that:

- Provide dispatchable power

- Provide long duration energy storage
- Provide carbon negative emissions
- Help meet the requirements of SB 1383 to reduce methane and black carbon
- Reduce wildfire risks
- Use noncombustion conversion and generation technologies

Thank you for your consideration of these comments. We look forward to working with the Commission on these important programs and issues.

Sincerely,

Julia A. Levin
Executive Director