Tell The Dam Truth, Patagonia, Friends of the River, Rios to Rivers, Save The World's Rivers, California Trout, Ridges to Riffles, Center for Biological Diversity

March 25, 2026

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Submitted via Email, Return Receipt Requested

Re: Petition for rulemaking to add dams and reservoirs as reporting entities under the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions

Dear Chair Randolph:

On behalf of Tell the Dam Truth (TTDT), Patagonia, Friends of the River (FOR), Rios to Rivers, Save The World's Rivers, California Trout (CalTrout), Ridges to Riffles, and the Center for Biological Diversity (the Center), we respectfully submit this Petition for Rulemaking to the California Air Resources Board (CARB) pursuant to California Government Code § 11340.6. We request that CARB initiate a rulemaking and other appropriate actions to add dams and reservoirs as reporting entities under California's Regulation for the Mandatory Reporting of Greenhouse Gas (GHG) Emissions (referred to hereafter as "MRR"). In the California Global Warming Solutions Act (AB 32) (2006), the California Legislature tasked CARB with adopting regulations requiring the reporting and verification of greenhouse gas emissions from sources that contribute most to state emissions.[1] Dams and reservoirs readily fall into this category, and CARB has a duty to include them in required GHG reporting.

TTDT has engaged in three conversations with CARB staff over the past nine months regarding the GHG emissions from dam and reservoir systems. During those conversations, staff suggested that these emissions might best be captured in California's Natural and Working Lands Inventory, which provides a quantitative estimate of the existing state of ecosystem carbon stored in the State's land base. However, this approach ignores the reality that dam and reservoir systems are anthropogenic processes that generate point source-type emissions similar to the other facilities and source categories currently required to report emissions under the MRR. Moreover, inclusion in the MRR would potentially allow CARB to set reporting requirements for imported hydropower, which would not be available under a Natural and Working Lands

[1] Cal. Health & Safety Code §§ 38510, 38530.

framework. As this petition explains, dam and reservoir system emissions fit well within the MRR's current purpose and structure and should be included in the reporting requirements.

Numerous scientific studies over the past two decades have established that dams and reservoirs produce and emit substantial amounts of carbon dioxide, methane, and nitrous oxide. These GHG emissions include reservoir surface emissions, which occur when dams trap organic material and leached synthetic fertilizers that decompose beneath a reservoir's water. Dam and reservoir facilities and operations also emit GHGs from several other emission points, including hydropower turbines, spillways, and downstream water discharges.

The U.S. Army Corps of Engineers catalogues 1,563 dam and reservoir facilities in California with dam heights greater than 25 feet and storage capacity exceeding 15 acre-feet or with dam heights greater than 6 feet in height and storage capacity of 50 acre-feet or more. Of these, 240 are identified as hydroelectric projects, including run-of-river, reservoir-based storage, and pumped-storage systems.[2] In 2022, hydropower accounted for 8.67% of total in-state system electricity generation in California, and out-of-state large hydropower accounted for 14.2% of electricity imports (11,921 of 83,962 total imported GWh).[3] Scientific studies show that individual dams and reservoirs like those in California emit large amounts of GHGs every year. For example, Hoover Dam and Lake Mead (which is a reservoir and not a natural lake) cause the emission of approximately 4.7 million metric tons of carbon dioxide equivalent (CO_2e) annually.[4] These emissions include 732,000 metric tons of CO_2e directly attributable to hydropower infrastructure and generation. The proposed Sites Reservoir in California is predicted to cause the emission of 662,000 metric tons of CO2e annually.[5] Additionally, one of the earliest studies of GHG emissions from reservoirs in California was published in 2004 and included estimates for Shasta Reservoir, New Melones Reservoir, and Oroville Reservoir.[6] Shasta was estimated to emit 34,200 metric tons of CO2e/year, New Melones: 10,400 metric tons, and Oroville: 13,100 metric tons.[7] These early estimates only include "diffusive flux" and

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[2] U.S. Army Corps of Engineers, National Inventory of Dams, https://nid.sec.usace.army.mil/nid/#/ (last visited October 6, 2025).

[3] California Energy Commission, 2022 Total System Electric Generation ("2022 Total System Electric Generation"), https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/2022-total-system-electric-generation (last visited July 26, 2024).

[4] Gary Wockner, Mark Easter & Gordon McCurry, *Estimate of Greenhouse Gas Emissions caused by the Glen Canyon and Hoover Dam Facilities using the All-Res Modeling Tool* ("*Estimate of Greenhouse Gas Emissions: Glen Canyon and Hoover Dam Facilities*") (2024), https://tellthedamtruth.com/wp-content/uploads/2024/09/Powell-Mead-Combined-All-Res-Final-Draft-9-11-2024.pdf.

[5] Gary Wockner, Mark Easter & Gordon McCurry, *Estimate of Greenhouse Gas Emissions for the Proposed Sites Reservoir Project using the All-Res Modeling Tool* ("*Estimate of Greenhouse Gas Emissions: Sites Reservoir Project*") (2023), https://tellthedamtruth.com/wp-content/uploads/2023/08/Sites-Reservoir-Projectect-Emissions-V4.pdf.

[6] Nicolas Soumis, Éric Duchemin, René Canuel & Marc Lucotte. *Greenhouse Gas Emissions from Reservoirs of the Western United States* ("*Greenhouse Gas Emissions: Reservoirs of the Western United States*"), Global Biochemical Cycles 18, no. 3 (September 24, 2004), https://doi.org/10.1029/2003GB002197.

[7] Bridget R. Deemer, John A. Harrison, Siyue Li, Jake J. Beaulieu, Tonya DelSontro, Nathan Barros, José F. Bezerra-Neto, Stephen M. Powers, Marco A. dos Santos & J. Arie Vonk. *Greenhouse Gas Emissions from Reservoir*

(footnote continued on next page)

not "ebullitive flux" from littoral regions of the reservoirs, which have been estimated to be 50 – 100 times larger than diffusive flux.[8] These emissions can exceed the annual GHG emissions from coal- and gas-fired power plants with similar generation capacity, and these emissions are equivalent to the GHG emissions of hundreds of thousands, even millions, of gas-powered vehicles. Finally, a new scientific study, included in this submission, estimates that the emissions from California's 368-biggest reservoirs totaled at least 5.3 million metric tons of CO_2e per year. That's the same amount of emissions from approximately 1.2 million gas-powered vehicles driven on California's roads in one year.[9]

Yet, although dams and reservoirs emit large amounts of GHGs, California law does not currently require these facilities to measure or report their GHG emissions. As a result, California decisionmakers, agencies, utilities, and other stakeholders frequently overlook and ignore these GHG emissions. For example, dams and reservoirs are interconnected and necessary components of most hydropower generation. California regulators and policymakers often incorrectly assume and state that hydropower is a clean energy resource that emits zero carbon, when some hydropower facilities actually emit massive amounts of GHGs. In fact, "[e]lectricity generating facilities that are solely powered by … hydroelectric … energy" with on-site stationary combustion emissions that equal or exceed 10,000 metric tons of CO_{2e} are explicitly exempt from reporting requirements under California's MRR.[10] As a result, CARB, other state agencies, legislators, and utilities frequently make decisions regarding climate policies and a cleaner electric sector based on incomplete information and mistaken assumptions regarding dams and reservoirs' GHG emissions. In addition, state agencies typically fail to assess dams and reservoirs' substantial GHG emissions when they analyze and approve new water supply projects and make other management decisions regarding water projects.[11]

Accordingly, this Petition requests that CARB promptly initiate a rulemaking to require reporting of these anthropogenic greenhouse gas emissions from these anthropogenic dams and reservoirs under the MRR. Granting this Petition would raise awareness of dams and reservoirs' GHG emissions and help ensure that California regulators, policymakers, and the public have access to accurate and timely GHG data for these facilities. Adding dams and reservoirs to the MRR would also enable better-informed climate policies throughout the state. Requiring dams and reservoirs to report their GHG emissions, similar to other emissions sources or facilities currently under the MRR, will ensure that California agencies and utilities have access to the best available information regarding hydropower's GHG emissions as they make decisions on the future of the electric sector, and will aid decision-makers in pursuing a clean energy future that is

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Water Surfaces: A New Global Synthesis ("*Greenhouse Gas Emissions: Reservoir Water Surfaces*"), BioScience 66, no. 11 (November 1, 2016): 949–64, https://doi.org/10.1093/biosci/biw117.

[8] *Id.*

[9] Mark Easter: Estimate of Methane Emissions from Major Dams and Reservoirs in the State of California, (December 2025).

[10] 17 Cal. Code of Regulations (CCR) § 95101(f)(1). All references to specific regulatory sections of the MRR are to Title 17 of the California Code of Regulations and will be referred to hereafter as "MRR § __."

[11] For example, the environmental impact analysis for the Sites Reservoir project in the Sacramento River Watershed did not address emissions resulting from the creation and existence of a reservoir that would inundate large amounts of wetland. *See* Sites Project Authority. 2023. Final Environmental Impact Report/Environmental Impact Statement. https://sitesproject.org/final-environmental-impact-report/.

actually clean, not greenwashed. Moreover, obtaining accurate and timely data on dams and reservoirs' substantial methane emissions will help California achieve its goal of reducing methane emissions by 40% compared to 2013 emission levels.[12]

Granting this petition would also align with recent statements from California Governor Gavin Newsom regarding the need for better intergovernmental cooperation and inventories of methane emissions. In a September 2023 press release, Governor Newsom launched a new pledge for governments around the world to commit to reducing global methane emissions. This pledge—aimed at subnational governments like California—builds on the Global Methane Pledge, a multinational agreement that commits the United States to reducing its methane emissions 30% by 2030. As Governor Newsom explained, "We're partnering with governments around the world to tackle methane emissions…. By working together on strategies informed by science, like deploying methane detection satellites, we can help address this global threat."[13] As part of this same methane pledge announcement, California Natural Resources Secretary Wade Crowfoot stated, "We're tackling the root causes of climate change head-on, and confronting methane emissions is one more critical step towards real impact."[14]

More recently, Governor Newsom announced the launch of a groundbreaking satellite data project to "locate and monitor large emissions of methane that could otherwise go undetected."[15] In creating this project, as well as other legislative efforts, California has taken the lead on pushing back against the Trump Administration's rollbacks of climate policy and GHG monitoring. Yet, scientists and regulators in most jurisdictions, including California, currently ignore the methane emissions from dams and reservoirs. All of the root causes of climate change cannot be confronted if governments fail to take into account the methane emissions from dams and reservoirs. This Petition seeks to advance the understanding and awareness of this substantial source of methane emissions.

When the California Legislature directed CARB to adopt and implement the MRR by January 2008, it mandated that CARB also "[p]eriodically review and update its emission reporting requirements, as necessary."[16] Yet CARB has not added any new source categories to

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[12] Press Release, California Air Resources Board, "California launches methane-cutting effort with subnational governments at COP28," https://ww2.arb.ca.gov/news/california-launches-methane-cutting-effort-subnational-governments-cop28#:~:text=California%20set%20a%20goal%20to,monitor%20for%20large%20methane%20plumes (last visited on June 30, 2024).

[13] Press Release, Office of Governor Gavin Newsom, "California Enlists Governments Around the World to Fight Methane Pollution" (September 20, 2023), https://www.gov.ca.gov/2023/09/20/california-enlists-governments-around-the-world-to-fight-methane-pollution/.

[14] Press Release, California Air Resources Board, "California launches international methane-reduction initiative during Climate Week" (September 20, 2023), https://www.gov.ca.gov/2023/09/20/california-enlists-governments-around-the-world-to-fight-methane-pollution/.

[15] Press Release, Office of Governor Gavn Newsom, "As U.S. EPA rolls back protections, California launches satellite project to detect and reduce dangerous methane leaks" (Mar. 21, 2025), https://www.gov.ca.gov/2025/03/21/as-u-s-epa-rolls-back-protections-california-launches-satellite-project-to-detect-and-reduce-dangerous-methane-leaks/.

[16] Cal. Health & Safety Code § 38530(c)(1).

the MRR since 2016. Because dams and reservoirs emit large amounts of GHGs and because these emissions are often overlooked, CARB should seize this opportunity to expand and evolve the MRR so that California policymakers and the public have accurate and timely information regarding these significant sources of GHG emissions.

SUBSTANCE AND NATURE OF ACTION REQUESTED

Petitioners TTDT et al. request that CARB (1) initiate a rulemaking to require reporting in the MRR of greenhouse gas emissions from dam and reservoir systems located in California, and from dam and reservoir systems that generate energy and/or supply water used in California; and (2) initiate a rulemaking to repeal existing language exempting hydropower facilities from MRR reporting requirements. In requesting that CARB require reporting of emissions from "dam and reservoir systems," Petitioners are referring to all dams and reservoirs, including their component parts and ancillary structures.[17] When this Petition discusses "hydropower facilities," it is referring to hydropower facilities that also include dams and reservoirs that divert, manipulate, or impound water, which account for most of California's hydropower generation.

INTEREST OF PETITIONERS

Tell The Dam Truth (TTDT) is a 501(c)(3) grassroots environmental group. TTDT works to fight the climate crisis by protecting and restoring free-flowing rivers. TTDT believes that river ecosystem biodiversity and carbon sequestration are critical to the planet's health. Because dams can injure and kill rivers, TTDT works to include and address the impacts of river-destroying dams in all public decision-making around dam permitting, re-licensing, and decommissioning.

TTDT's most immediate goal is to support river-protection groups by engaging with federal and state agencies to make sure that the greenhouse gas emissions from dams and reservoirs are counted, reported, and then considered during policy making, rulemaking, and legislation. To further this initiative, TTDT recently filed a legal petition with the U.S. Environmental Protection Agency (EPA) arguing that greenhouse gas emissions from dams and reservoirs be added to the EPA's "Greenhouse Gas Reporting Program." This petition received the sign-on support of over 140 environmental groups and a few businesses. TTDT has also worked with the EPA on its yearly GHG Inventory reported to the United Nations, using Intergovernmental Panel on Climate Change (IPCC) guidelines.

Founded by Yvon Chouinard in 1973, Patagonia is an outdoor apparel company based in Ventura, California. As a Certified B Corporation, the company is in business to save our home planet. Patagonia's grant making, advocacy, communications, and activism have long prioritized the health of America's freshwater ecosystems. Patagonia has advocated for the removal of dams to support the protection of wild, native fish populations and the communities that depend on them. This has included more than $4 million in grants to nonprofit groups since 2000, as well as

[17] As per MRR definition, "facility," includes "any physical property, plant, building, structure, source, or stationary equipment located on one or more contiguous or adjacent properties in actual physical contact or separated solely by a public roadway or other public right-of-way and under common ownership or common control, that emits or may emit any greenhouse gas." MRR § 95102(a).

numerous films and campaigns, including three award-winning documentaries: DamNation, Blue Heart, and Artifishal.

Friends of the River (FOR) is a 501(c)(3) organization founded to protect and restore California's rivers, streams, and watersheds by influencing public policy and inspiring citizen action. For more than a half-century, FOR has been at the forefront of California's environmentalist movement for a just and sustainable water future. Through the years, some areas of intense focus have been: participating in the passage of California's Wild and Scenic Rivers Act and spearheading successful Wild and Scenic River campaigns throughout the state; working to reduce the negative impacts of hydropower projects on rivers, including through protecting the State's delegated authority under the federal Clean Water Act; working on flood management and dam safety; and working to prevent wasteful dam and infrastructure projects. FOR views healthy rivers as a critical component of the State's ability to adapt to climate change, and rejects the notion that the state must choose between healthy river ecosystems and having enough water.

Save The World's River is a grassroots, non-profit 501(c)(3) environmental organization dedicated to the protection and restoration of rivers across the planet with a primary focus on rivers in the western U.S. and their tributaries. Save The World's River has approximately 50,000 members, supporters, and followers throughout the U.S. who live, work, and recreate on rivers that are impacted by dams and reservoirs. Save The World's Rivers' mission is to support the conservation of rivers through science, public education, advocacy, and litigation.

California Trout (CalTrout) is a 501(c)3 non-profit organization founded in 1971 and headquartered in San Francisco, California. CalTrout's mission is to ensure healthy waters and resilient wild fish for a better California. CalTrout manages over 60 large-scale freshwater restoration projects throughout the state of California. Our goal is to restore populations of California's native salmon and steelhead trout and preserve California's keystone species for future generations. CalTrout's ten regional offices work to address California's complex natural resource issues driven by climate change and to protect and restore California's unique biodiversity.

The Ridges to Riffles Indigenous Conservation Group (R2R) is an Indigenous-led conservation non-profit 501(c)(3) organization dedicated to helping Indigenous Peoples protect and restore the natural and cultural resources they rely on. We work to support Tribal sovereignty, revitalize traditional ecological knowledge, and advance Indigenous leadership in environmental stewardship. Through collaboration, advocacy, and restoration, we aim to ensure healthy lands, waters, and communities for future generations.

The Center for Biological Diversity (the Center) is a 501(c)(3) non-profit environmental organization dedicated to protecting imperiled species and their habitats through science, policy and environmental law. The Center has over 1.7 million members and on-line activists worldwide, including over 212,000 in California. Seeking to address the close connections between the climate and extinction crises, the Center has engaged in litigation and regulatory advocacy in California and elsewhere to require accounting, reduction, and mitigation of greenhouse gas emissions. The Center has also long been involved in litigation and advocacy to

protect California's rivers and streams by enforcing instream flow requirements, ensuring effective fish passage, fighting harmful water diversions, and applying public trust principles.

Founded in 2012, Ríos to Rivers programs have connected over 1,000 underserved and Indigenous students from 20 endangered river basins in seven countries. The programs have included students and community leaders from 21 Indigenous nations. We envision a world in which youth who are intimately connected to their local waters and tribal communities are equipped to become the next generation of passionate leaders for healthy rivers and communities. In 2025, Rios to Rivers organized the first source-to-sea descent of the newly free Klamath River led by youth from our Paddle Tribal Waters program.

REASON FOR THE REQUEST

I. Statutory and Regulatory Background

California has long touted its "tradition of environmental leadership" at the "forefront of national and international efforts to reduce greenhouse gasses."[18] Yet, much of California's early GHG emissions policy was developed around the late 2000s and relies on the inaccurate assumption that hydropower is a "clean" energy source. As this Petition explains, developments in climate science and our understanding of dams and reservoir systems since that time no longer support this assumption, and instead show that dams and reservoirs—including those without hydropower generation facilities—are a significant source of GHG emissions. CARB must revise its MRR accordingly to require GHG reporting for dam and reservoir systems.

A. Assembly Bill 32

In 2006, California passed the California Global Warming Solutions Act, colloquially referred to as Assembly Bill (AB) 32. This landmark legislation declared global warming a "serious threat" and laid out various measures to combat its effects.[19] AB 32 designated CARB as the lead agency on these efforts and gave it authority to design, implement, and enforce measures to reduce GHG emissions.[20] CARB "is the state agency charged with monitoring and regulating sources of emissions of greenhouse gases that cause global warming in order to reduce emissions of greenhouse gases."[21] AB 32 directed CARB to prepare and periodically update a "scoping plan" for "achieving the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions from sources or categories of sources of greenhouse gases."[22]

As part of this effort, AB 32 directed CARB to adopt regulations requiring the reporting and verification of statewide GHG emissions, now known as the Mandatory Greenhouse Gas

[18] Cal. Health & Safety Code § 38501(c).

[19] *Id.,* § 38501.

[20] *Id.,* § 38501(h).

[21] *Id.,* § 38510.

[22] *Id.,* § 38561.

Emissions Reporting Regulation (MRR).[23] AB 32 also set an overall goal of reducing statewide GHG emissions, "including all emissions of greenhouse gases from the generation of electricity delivered to and consumed in California."[24]

The Legislature gave CARB broad power through AB 32. In directing CARB to establish the MRR, AB 32 specifies that the regulation shall "[r]equire the monitoring and annual reporting of greenhouse gas emissions from greenhouse gas emission sources beginning with the sources or categories of sources that contribute the most to statewide emissions."[25] GHG emission sources are defined as "any source, or category of sources, of greenhouse gas emissions whose emissions are at a level of significance, as determined by the state board, that its participation in the program established under this division will enable the state board to effectively reduce greenhouse gas emissions and monitor compliance with the statewide greenhouse gas emissions limit."[26] Section 38562 further details the GHG emission limits and reduction regulations needed to meet the goals set forth in AB 32. For these regulations, CARB is instructed to "consider the significance of the contribution of each source or category of sources to statewide emissions of greenhouse gases."[27]

B. Executive Orders and Other California Laws Regarding Climate Change

To further the State's ambitious climate goals, California governors have issued a series of executive orders articulating specific targets for reducing GHG emissions. In 2005, then Governor Arnold Schwarzenegger issued Executive Order S-3-05, which established the following GHG emission reduction targets:

- By 2010, reduce GHG emissions to 2000 levels
- By 2020, reduce GHG emissions to 1990 levels
- By 2050, reduce GHG emissions to 80 percent below 1990[28]

The first two of these goals were enshrined in AB 32. A few years later, Governor Schwarzenegger issued Executive Order S-14-08, which established a target that all retail sellers of electricity shall serve 33 percent of their load with renewable energy by 2020.[29] Executive Order S-21-09 then provided that CARB "shall establish the highest priority for those resources that provide the greatest environmental benefits with the least environmental costs and impacts

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[23] *Id.,* § 38530.

[24] *Id.,* § 38505(m).

[25] Cal. Health & Safety Code § 38530(b)(1).

[26] *Id.,* § 38505(i).

[27] *Id.,* § 38562(b)(9).

[28] California Governor's Office, Executive Order S-3-05 (June 2, 2005), https://www.library.ca.gov/wp-content/uploads/GovernmentPublications/executive-order-proclamation/5129-5130.pdf.

[29] California Governor's Office, Executive Order S-14-08 (November 17, 2008), https://www.library.ca.gov/wp-content/uploads/GovernmentPublications/executive-order-proclamation/38-S-14-08.pdf.

on public health that can be developed most quickly and that support reliance, efficient, cost-effective electricity system operations…"[30]

In 2015, Governor Jerry Brown signed an executive order that set interim statewide GHG emission reduction targets to reduce GHG emissions to 40 percent below 1990 levels by 2030.[31] The Legislature adopted the same goal in 2016.[32] Governor Brown updated these targets again in 2018, when he issued an executive order to "achieve carbon neutrality as soon as possible, and no later than 2045, and achieve and maintain net negative emissions thereafter. This goal is in addition to the existing statewide targets of reducing greenhouse gas emissions."[33]

Many of these same goals were enshrined in Assembly Bill 1279 (2022), the California Crisis Act.[34] In addition to incorporating Governor Brown's goal of achieving carbon neutrality as soon as possible, AB 1279 requires CARB to ensure that its scoping plan updates "identify and recommend measures" to achieve carbon neutrality, and to identify and implement policies and strategies that enable CO_2 removal solutions.[35] AB 1279 also adopts an even stronger long-term target than Governor Schwarzenegger set in Executive Order S-3-05, requiring that statewide anthropogenic GHG emissions be reduced to at least 85 percent below 1990 levels by 2050.[36]

Similarly, Senate Bill (SB) 100 mandates that CARB, along with other agencies, plan for 100 percent of total California retail sales of electricity to come from renewable energy resources and zero carbon resources by December 31, 2045.[37] Together, these executive orders and laws demonstrate California's commitment to GHG reduction and CARB's key role in ensuring that California's GHG targets are met.

C. Development of the Mandatory Greenhouse Gas Emissions Reporting Regulation

Developed by CARB under AB 32's authorizing language, the MRR sets reporting, verification, and other requirements for certain facilities that emit greenhouse gases (GHGs). Multiple entities are subject to the requirements under the MRR, such as electricity generation units, petroleum refineries, cement production facilities, and numerous other industries.[38] The

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[30] California Governor's Office, Executive Order S-21-09 (September 15, 2009), https://web.archive.org/web/20091123220131/http://gov.ca.gov/index.php?/executive-order/13269/.

[31] California Governor's Office, Executive Order B-30-15 (April 29, 2015), https://www.library.ca.gov/wp-content/uploads/GovernmentPublications/executive-order-proclamation/39-B-30-15.pdf.

[32] Stats. 2016, ch. 249 (Sen. Bill No. 32); Cal. Health & Safety Code § 38566.

[33] California Governor's Office, Executive Order B-55-18 (September 10, 2018), https://archive.gov.ca.gov/archive/gov39/wp-content/uploads/2018/09/9.10.18-Executive-Order.pdf.

[34] Cal. Health and Safety Code § 38562.2.

[35] *Id.*, § 38562.2(d).

[36] *Id.*, § 38562.2(c)(2).

[37] Cal. Public Utilities Code § 454.53(a).

[38] MRR § 95101(a)(1)(A).

reporting requirements vary according to the nature of the reporting entity and the levels of GHGs emitted.[39] Emissions reporting data is submitted on an annual basis, subjected to third-party verification, and consolidated into a public summary that then informs California's other climate change and GHG efforts.[40]

Importantly for this Petition, MRR does not apply to, and GHG reporting is not required for, "[e]lectricity generating facilities that are solely powered by nuclear, *hydroelectric*, wind, or solar energy, unless on-site stationary combustion emissions equal or exceed 10,000 metric tons of CO_2e."[41] CARB does require emissions reporting from some electricity generating facilities that do not fall under this exemption.[42] The MRR does not currently require reporting from non-hydroelectric dams and reservoirs.

When CARB implemented the first version of the MRR in 2008, it recognized that obtaining accurate and detailed GHG emissions data is a critical first step for addressing climate change. CARB articulated the following principles that underlie the MRR:

1. The MRR should expand and evolve over time.

In its Initial Statement of Reasons for developing the MRR, CARB explained that "staff will propose updates to this regulation in future years, to improve the current requirements and to add sectors as the overall California GHG program is further defined and calculation methods are adopted."[43] Some "[a]dditional sources of GHG emissions … will also be added to this regulation in future years as the greenhouse gas reduction program progresses."[44] "As required by [AB 32], this regulation will be periodically reviewed and updated … and new sectors will be added."[45]

2. The MRR should act as a key part of California's leadership in fighting climate change.

CARB recognized that "[a]ction taken by California to reduce emissions of greenhouse gases will have important effects by encouraging other states, the federal government, and other countries to act. By exercising a leadership role, California will also position its economy, technology centers, academic and financial institutions, and businesses to benefit from national and international efforts to reduce emissions of greenhouse

[39] *See* MRR § 95101.

[40] *See* California Air Resources Board, Mandatory Greenhouse Gas Emissions Reporting: About, https://ww2.arb.ca.gov/our-work/programs/mandatory-greenhouse-gas-emissions-reporting/about (last visited July 24, 2024).

[41] MRR § 95101(f)(1)(emphasis added).

[42] MRR §§ 95112(a),(g).

[43] California Environmental Protection Agency: Air Resources Board, *Staff Report: Initial Statement of Reasons for Rulemaking, Proposed Regulation for Mandatory Reporting of Greenhouse Gas Emissions* (October 19, 2007), viii, https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2007/ghg2007/isor.pdf.

[44] *Id.* at 4.

[45] *Id.* at 10.

gases."[46] CARB further explained that the MRR and "the data collected will improve California's GHG inventory, provide a mechanism to track emissions trends, and support emission reduction strategies. The regulation is a central component of our efforts to quantify, evaluate, and reduce greenhouse gas emissions."[47]

3. The MRR should provide accurate information about GHG emissions from reporting entities.

"The goal of the GHG reporting regulation is to collect complete and accurate GHG emissions data from facilities subject to reporting."[48]

After CARB implemented the MRR in 2007, it promptly added several additional source categories to the program that were not covered by its initial rulemaking.[49] However, CARB has not added any new source categories to the MRR since 2016.[50]

II. NEW SCIENCE REGARDING GREENHOUSE GAS EMISSIONS FROM DAMS AND RESERVOIRS

As noted above, scientists have conducted significant new research into greenhouse gas emissions from dam and reservoirs systems since the initial development of California's climate change legislation, policies, and programs. Much of this new research has come out in the years since the MRR's last update. The following provides an overview of those developments and how they should inform CARB's MRR requirements regarding anthropogenic sources of GHG emissions.

A. Dams, reservoirs, and hydropower facilities in California.

Dams and reservoirs are located throughout California. These facilities have been built for numerous purposes, including water supply, hydroelectric power generation, flood control, recreation, irrigation, and navigation.

California has 1,563 dam and reservoir systems greater than 100 acres size, roughly 15% of which are hydroelectric projects, including run-of-river, reservoir-based storage, and pumped-storage systems.[51] In 2022, 14.2% of California's electricity imports came from out-of-state large hydropower, while utility-scale hydropower accounted for 8.6% of California's total in-state

[46] *Id.* at 2.

[47] *Id.* at 3.

[48] *Id.* at 20.

[49] *See, e.g.,* Mandatory Greenhouse Gas Reporting Regulation Amendments in 2010, 2012, 2013, and 2014, https://ww2.arb.ca.gov/mrr-regulation (last visited July 24, 2024).

[50] California Air Resources Board, Unofficial Electronic Version of the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions (2016), https://ww2.arb.ca.gov/sites/default/files/classic/cc/reporting/ghg-rep/regulation/mrr-2016-unofficial-2017-10-10.pdf (last visited July 24, 2024).

[51] U.S. Army Corps of Engineers, National Inventory of Dams, https://nid.sec.usace.army.mil/nid/#/(last visited October 6, 2025).

system electricity generation.[52] Although some hydropower generation occurs at run-of-the-river dams that may not have a reservoir (or that have only a small reservoir), the U.S. Energy Information Administration has explained that "[m]ost U.S. hydroelectricity is produced at large dams on major rivers, and most of these hydroelectric dams were built before the mid-1970s by federal government agencies."[53] The hydropower facilities in California generating the greatest net amount of electricity in 2022 were the Shasta Powerplant at Shasta Reservoir (766 gigawatt-hours, conventional operation) and the Edward C. Hyatt Project at Oroville Dam (929 gigawatt-hours, conventional and pumped-storage operation).[54]

This Petition requests that CARB list dams and reservoirs that generate hydropower, as well as dams and reservoirs without hydropower components, as reporting entities under the MRR. Moreover, when this Petition discusses hydropower facilities, it is referring to hydropower facilities that include dams and reservoirs that divert, manipulate, or impound water, which account for most of the California's hydropower generation.

B. Methane, carbon dioxide, and nitrous oxide are key drivers of the climate change crisis, yet greenhouse gas emissions from dams and reservoirs are often overlooked.

In August 2021, the Intergovernmental Panel on Climate Change (IPCC) issued several reports that vividly highlight the climate emergency the planet is facing.[55] Heat-trapping climate pollutants—including methane, carbon dioxide, and nitrous oxide—have both short- and long-term effects of increasing the "greenhouse effect" that causes climate change.

In the United States, scientists have linked climate change to the ever-increasing environmental calamities battering our landscape, such as wildfires, hurricanes, and drought. The 2021 IPCC reports have been described as a "code red for humanity."[56] In the past five years, wildfires in California and the Pacific Northwest, drought in the Southwest, and hurricanes on all U.S. Coastlines have been more intense and financially damaging than at any time in U.S. history.

Climate scientists, including those affiliated with the IPCC and CARB, have identified many of the primary GHG emission sources in numerous reports. Chief among those sources are the production and consumption of fossil fuels and GHG emissions from land use, including high-intensity industrial agriculture, forestry, and land use changes.[57] CARB, other California

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[52] 2022 Total System Electric Generation, https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/2022-total-system-electric-generation.

[53] *Id.*

[54] *Id.*

[55] IPCC, *Sixth Assessment Report, Climate Change 2021 (*2021), https://www.ipcc.ch/report/ar6/wg1/.

[56] Matt McGrath, *Climate change: IPCC report is 'code red for humanity,'* BBC News (Aug. 9, 2021), https://www.bbc.com/news/science-environment-58130705.

[57] *See, e.g.*, EPA, Sources of Greenhouse Gas Emissions, https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions (last visited October 13, 2021).

state agencies, and governments across the world have conducted considerable research on the GHG emissions from these sources, and regulatory efforts in California have primarily focused on reducing emissions from fossil fuel production and consumption.

For this reason, some sources of GHG emissions have historically received less scientific and regulatory attention. Yet these overlooked GHG sources—including dam and reservoir systems—are gaining increasing attention as scientific evidence of their impacts accumulates. As an example, in a 2006 report titled *CH4 Emissions from Flooded Land*, the IPCC provided a framework for calculating methane emissions from flooded landscapes, including anthropogenic reservoirs.[58] The IPCC further refined these GHG estimates for flooded lands in 2019.[59] The 2019 refinement includes a discussion of GHG emissions from reservoirs.[60] Although the IPCC has developed these frameworks for emissions inventories, GHG emissions from flooded lands and reservoirs remain largely overlooked in American inventories. For example, the USEPA first began estimating GHG emissions from dams and reservoirs as a source category in 2022, and may be the first government in the world to do so, despite ever-mounting evidence in the scientific literature of the significance of those emissions. As noted, California does not currently include emissions from dam and reservoir systems as a source category in its mandatory GHG reporting requirements, despite the fact that these emissions are comparable to other source categories that are included on the MRR.

C. Multiple peer-reviewed scientific studies show that dams and reservoirs emit substantial amounts of methane and carbon dioxide annually.

Scientists have repeatedly documented substantial greenhouse gas emissions from dams and reservoirs in California, the United States, and across the world. More than thirty years ago, a team of scientists in Brazil began measuring the methane produced at hydropower dams and reservoirs. Led by Dr. Philip Fearnside, a research scientist at Brazil's National Institute for Amazonian Research, these scientists discovered something new at the time: hydropower dams and reservoirs in tropical countries such as Brazil emit high levels of GHGs, especially methane. At some facilities, emissions directly caused by hydroelectricity generation (i.e., the specific hydroelectric features and use of the reservoirs) were several times higher than emissions from coal-fired power plants. Dr. Fearnside first reported the discovery of GHG emissions from these facilities in 1995, and after years of research, he published a 2008 article in *Oecologia Australis* detailing these findings.[61]

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[58] See IPCC, *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Vol. 4: Agriculture, Forestry and Other Land Use* ("*IPCC 2019 Refinement Report*") (2019), https://www.ipcc-nggip.iges.or.jp/public/2019rf/vol4.html.

[59] *Id.*

[60] *Id.* at vol. 4, ch. 7, sec. 3.

[61] Philip Fearnside, *Hydroelectric Dams as "Methane Factories": The Role of Reservoirs in Tropical Forest Areas as Sources of Greenhouse Gases*, 12 Oecologia Australis (2008), https://www.semanticscholar.org/paper/HYDROELECTRIC-DAMS-AS-%E2%80%9CMETHANE-FACTORIES%E2%80%9D%3A-THE-ROLE-Fearnside/a4454cf836d9543cc3f087e47457749207d943d0.

Around the same time, other scientists around the world launched new studies that confirmed the Brazilian results in subtropical and temperate regions. One of the first studies of reservoir emissions conducted in the United States analyzed greenhouse gas emissions from reservoir surfaces in the Western U.S., including three reservoirs in California (Shasta, Oroville, New Melones).[62] The study reported the following conclusion:

> *The present study has shown that reservoirs generally constitute an appreciable source of both CH4 and CO2 for the atmosphere when considering their total GHG budgets (diffusive and degassing fluxes).*

Since the IPCC first included calculations for measuring methane emissions from flooded lands in national greenhouse gas inventories in 2006,[63] study after study has confirmed high levels of methane emissions from many dams and reservoirs. One 2016 study co-authored by a USEPA researcher found methane emissions from a reservoir in the midwestern United States to be as high as those measured at hydropower facilities in Brazil.[64] USEPA published a blog highlighting the study, which noted that "improved estimates of methane emissions from reservoirs will result in better information that can aid in the global effort to reduce greenhouse gas emissions."[65] Additional studies have documented significant dam and reservoir emissions in higher-latitude regions, such as the Pacific Northwest.[66, 67, 68, 69]

The science surrounding dam and reservoir GHG emissions has coalesced even further over the last decade. In 2016, an international team of scientists led by Dr. Bridget Deemer synthesized dozens of global studies to catalog methane emissions from dams and reservoirs around the world, providing further evidence that emissions from reservoir systems have been

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[62] Soumis et al., *Greenhouse Gas Emissions: Reservoirs of the Western United States*, https://doi.org/10.1029/2003GB002197.

[63] *IPCC 2019 Refinement Report,* Chapter 7: Wetlands, https://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html.

[64] Jake Beaulieu, Michael McManus & Christopher Nietch. *Estimates of Reservoir Methane Emissions Based on a Spatially Balanced Probabilistic-Survey*. LIMNOLOGY AND OCEANOGRAPHY 6 (November 2016): S27–40, https://doi.org/10.1002/lno.10284.

[65] US Environmental Protection Agency, The EPA Blog, *Bubbling Up: Methane from Reservoirs Presents Climate Change Challenge* (September 8, 2016), https://lakestewardship.org/2016/09/11/bubbling-up-methane-from-reservoirs-presents-climate-change-challenge-the-epa-blog/

[66] Benjamin L. Miller, Evan V. Arntzen, Amy E. Goldman & Marshall C. Richmond, *Methane Ebullition in Temperate Hydropower Reservoirs and Implications for US Policy on Greenhouse Gas Emissions*. ENVIRONMENTAL MANAGEMENT 60, no. 4 (October 2017): 615–29, https://doi.org/10.1007/s00267-017-0909-1.

[67] Soumis *et al*., *Greenhouse Gas Emissions: Reservoirs of the Western United States,* https://doi.org/10.1029/2003GB002197.

[68] Wockner et al., *Estimate of Greenhouse Gas Emissions: Sites Reservoir Project,* https://tellthedamtruth.com/wp-content/uploads/2023/08/Sites-Reservoir-Projectect-Emissions-V4.pdf.

[69] Gary Wockner, Mark Easter & Gordon McCurry, Estimate of Greenhouse Gas Emissions for the Lower Snake River Dams and Reservoirs using the All-Res Modeling Tool (2024), https://tellthedamtruth.com/wp-content/uploads/2024/03/LSR-Dam-Reservoir-Estimated-GHG-Emissions-Final.pdf.

widely ignored and dramatically underestimated (Deemer *et al*. 2016).[70] The USEPA, the U.S. Army Corps of Engineers, and the National Science Foundation funded this *Bioscience* study, which made international news.[71,72] The study recommended that the IPCC revise its calculations for GHG inventories for flooded lands and include dams and reservoirs' significant GHG emissions. Additional associated data published in 2020 further supported the earlier findings that reservoirs are a large source of GHG emissions across the world.[73] A 2021 global synthesis expanded upon the work by Deemer *et al*. (2016), highlighting the dangerous reality that reservoir systems contribute alarming quantities of methane to the atmosphere.[74]

A 2020 study co-authored by a USEPA research scientist highlights the substantial scope of U.S. dams and reservoirs' collective GHG emissions. The study explained that estimating the carbon dioxide and methane emissions from reservoirs "is important for regional and national greenhouse gas inventories."[75] The study analyzed the carbon dioxide and methane emissions from thirty-two reservoirs, and it found that all the reservoirs were sources of methane emissions.[76] Notably, the study estimated that methane emissions from dams and reservoirs in Ohio are the state's fourth largest anthropogenic source of methane.[77]

These studies' sweeping findings examined emissions from thousands of sites around the world and throughout the United States, including hundreds of dam and reservoir systems. There is no reason to believe that their conclusions do not apply directly to dam and reservoir systems in California. The physical, chemical, hydrologic, and biogeochemical processes that lead to anthropogenic emissions from reservoir systems reported in these studies are the same processes governing carbon and nitrogen cycling in California watersheds.

Attachment 1 to this Petition highlights the most significant of the more than 700 peer-reviewed scientific studies conducted over the past twenty-five years that analyze and document

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[70] Deemer et al., *Greenhouse Gas Emissions: Reservoir Water Surfaces*, 949-64, https://doi.org/10.1093/biosci/biw117.

[71] https://news.mongabay.com/2017/02/counterintuitive-global-hydropower-boom-will-add-to-climate-change/.

[72] https://www.washingtonpost.com/news/energy-environment/wp/2016/09/28/scientists-just-found-yet-another-way-that-humans-are-creating-greenhouse-gases/.

[73] Bridget R. Deemer, John A. Harrison, Siyue Li, Jake J. Beaulieu, Tonya DelSontro, Nathan Barros, José F. Bezerra-Neto, Stephen M. Powers, Marco A. dos Santos & J. Arie Vonk, *Data from: Greenhouse Gas Emissions from Reservoir Water Surfaces: A New Global Synthesis,* Dryad Dataset (January 6, 2020), https://datadryad.org/stash/dataset/doi:10.5061/dryad.d2kv0.

[74] Judith A. Rosentreter, Alberto V. Borges, Bridget R. Deemer, Meredith A. Holgerson, Shaoda Liu, Chunlin Song, John Melack, et al., *Half of Global Methane Emissions Come from Highly Variable Aquatic Ecosystem Sources* ("*Half of Global Methane Emissions*"), Nature Geoscience 14, no. 4 (April 2021): 225–30, https://doi.org/10.1038/s41561-021-00715-2.

[75] Jake Beaulieu, Sarah Waldo, David A. Balz, Will Barnett, Alexander Hall, Michelle C. Platz & Karen M. White, *Methane and Carbon Dioxide Emissions From Reservoirs: Controls and Upscaling* ("*Methane and Carbon Dioxide Emissions From Reservoirs*"), 125 JGR Biogeosciences (October 2020), https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2019JG005474.

[76] *Id.*

[77] *Id.*

the GHG emissions of dams and reservoirs.[78] This body of science makes clear that dams and reservoirs are substantial sources of GHG emissions in the state of California as well as around the world.

Indeed, if one solely examines the GHG emissions from reservoir surfaces and hydropower turbines in the State of California, those dams and reservoirs are a significant and consequential contributor to climate change. Mark Easter, an independent consultant with more than two decades experience in greenhouse gas inventories from ecosystem processes, prepared a summary paper in support of this Petition that estimates the surface and turbine emissions from major dams and reservoirs in California using a combination of publicly available, peer-reviewed sources.[79] Mr. Easter's paper is included as Attachment 2 to the Petition, and it concludes that reservoir surface and turbine emissions in California alone account for at least 5.3 million metric tons of CO2e per year in 2025, which is the same amount of emissions from approximately 1.2 million gas-powered vehicles driven on California's roads in one year.[80]

As the chart below shows, this estimate of annual GHG emissions just from major California reservoir surfaces and hydropower turbines is approximately equal to the State's shipping and aviation sectors, both of which are included in the State's annual inventory. Mr. Easter's GHG calculations are comparable on a per-area basis to emissions calculated in other peer-reviewed inventories in North America and other temperate regions.[81]

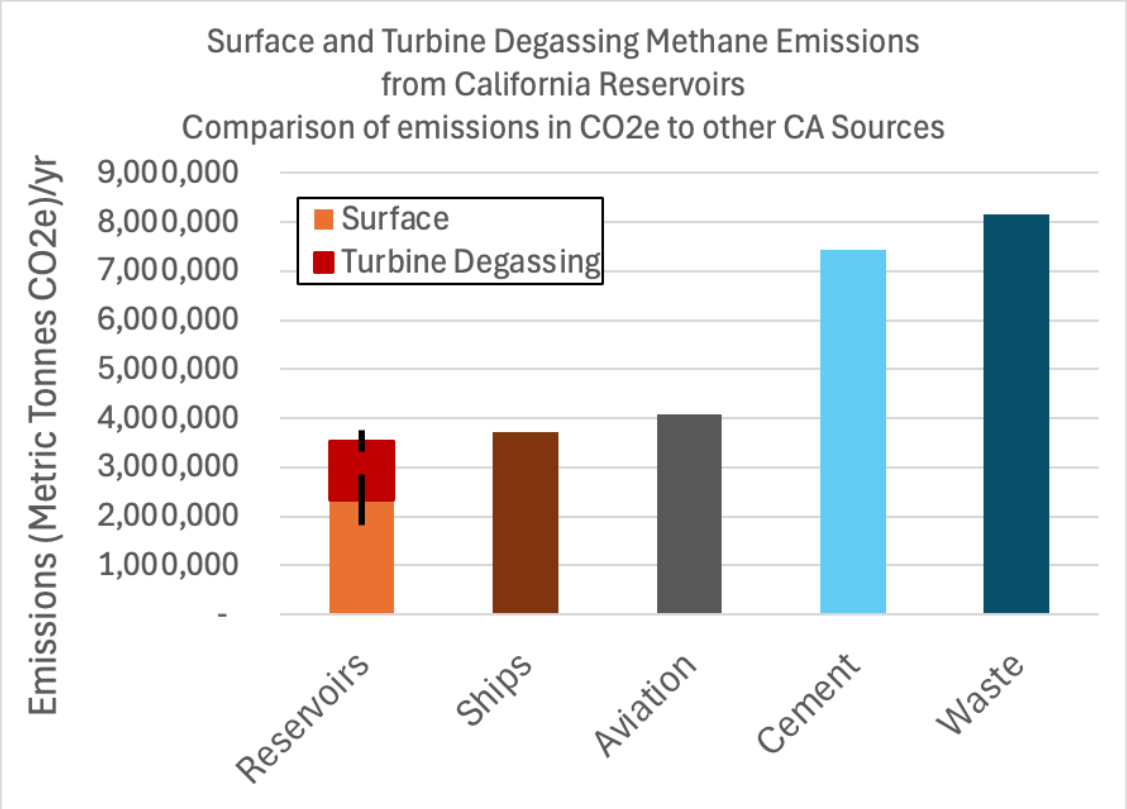
[78] Mark Easter. 2025. Highly Cited and Critical References for Dam, Reservoir, & Hydroelectric Facilities.

[79] Mark Easter, *Estimate of Methane Emissions from Major Dams and Reservoirs in the State of Californias*,

(February 2026) (Attach. 2).

[80] *Id.*

[81] *See, e.g.*, Deemer et al., *Greenhouse Gas Emissions from Reservoir Water Surfaces,* https://doi.org/10.1093/biosci/biw117; Deemer et al., *Data from: Greenhouse Gas Emissions from Reservoir Water Surfaces*, https://datadryad.org/stash/dataset/doi:10.5061/dryad.d2kv0; US Environmental Protection Agency, National Lakes Assessment for 2012 (2016), https://www.epa.gov/sites/default/files/2016-12/documents/nla_report_dec_2016.pdf.



D. The current scientific studies underestimate the full scope of dams and reservoirs' greenhouse gas emissions.

Although there is a growing body of evidence that anthropogenic greenhouse gas emissions from anthropogenic dams and reservoirs are substantial, current scientific studies continue to undercount the full extent of these emissions. Some of this undercounting comes from studies funded or carried out by groups with a vested interest in promoting dams and reservoirs, like industry groups and utilities. Underestimation of emissions from dams and reservoirs also results from a failure to recognize that greenhouse gases are emitted from myriad dam-related sources, not just large hydropower facilities or dam and reservoir surfaces. In fact, surface emissions represent just one of ten GHG emissions source categories associated with dams and reservoirs. Attachment 2 of this Petition describes these distinct GHG emission points in greater detail.[82] While some of these GHG emissions may be beyond the scope of what owners and operators would be required to report under the CARB program, they illustrate the broad array of GHG emissions from dams and reservoirs and the need for state and federal agencies to begin accounting for dams and reservoirs' annual operating emissions.

For all of these reasons, the GHG emissions from dams and reservoirs are likely even larger than the surface emissions identified in the peer-reviewed scientific studies summarized above.

[82] Mark Easter, *Estimate of Methane Emissions from Major Dams and Reservoirs in the State of Californias*, (Attach. 2).

1. Claims of "zero carbon" and "low carbon" facilities by industry groups, government agencies, and utilities promoting dams, reservoirs, and hydropower rely on the conclusion that dams and reservoirs are net carbon sinks. Such claims are misleading or false.

Studies of whether sediment carbon stocks in reservoirs emit more carbon from the atmosphere than they absorb, rendering them "a net source" of GHG emissions, or absorb more carbon than they emit, referred to as a "net sink," are mixed. A small number of studies (one funded by a hydropower utility) have concluded that reservoirs are net carbon sinks.[83, 84] Review papers from large geographic areas report that some reservoirs are net carbon sinks, while others are net carbon sources.[85, 86] The reviewers caution that the carbon balance of reservoirs is almost never examined through the entire growing season.[87] Crucially, most measurements come from the period when field work is easiest and safest, which largely coincides with periods when carbon uptake dominates, and not during seasonal periods such as temperate and boreal winters when carbon loss is more prevalent. One cannot confidently conclude from the scientific literature that all reservoirs, based on CO_2 flux measurements, are net carbon sinks.[88]

Additionally, these analyses confine their study to the reservoir boundary, and do not consider a) the fate of the carbon that would have been absorbed by and emitted from the ecosystem within the reservoir boundary and in affected areas downstream, if the reservoir had never been inundated, or b) the fate of that carbon after dam decommissioning when much or all of it would be flushed as sediment downstream and out of the system boundary. More recent

[83] E. Sikar, B. Matvienko, M. A. Santos, L. P. Rosa, M. B. Silva, E. O. Santos, C. H. E. D. Rocha & A. P. Bentes, *Tropical Reservoirs Are Bigger Carbon Sinks than Soils,* SIL Proceedings, 1922-2010 30, no. 6 (January 2009): 838–40, https://doi.org/10.1080/03680770.2009.11902252.

[84] Lesley B. Knoll, Michael J. Vanni, William H. Renwick, Elizabeth K. Dittman & Jessica A. Gephart. *Temperate Reservoirs Are Large Carbon Sinks and Small CO 2 Sources: Results from High-resolution Carbon Budgets,* Global Biogeochemical Cycles 27, no. 1 (March 2013): 52–64, https://doi.org/10.1002/gbc.20020.

[85] Deemer et al., *Greenhouse Gas Emissions: Reservoir Water Surfaces,* 949–64, https://doi.org/10.1093/biosci/biw117.

[86] Beaulieu et al., *Methane and Carbon Dioxide Emissions From Reservoirs,* https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2019JG005474.

[87] Deemer et al., *Greenhouse Gas Emissions: Reservoir Water Surfaces,* 949–64, https://doi.org/10.1093/biosci/biw117.

[88] *See, e.g., id.*

studies show that the estuaries and tidal flats in river deltas are net carbon sinks.[89, 90, 91, 92] Capturing organic matter in reservoirs upstream deprives estuaries and tidal flats of their carbon inputs, reversing the processes that contribute to the carbon sinks. The reservoir holds carbon in sediments that ultimately would have been stored in riparian wetlands or the river's delta estuary and tidal flats downstream. Capturing sediment behind dams commits a higher portion of the carbon in the sediment organic matter to become methane than would have occurred had the sediment moved through the river ecosystem to ocean estuaries and tidal flats in river deltas, which creates a large, net methane flux compared with undammed ecosystems. Additionally, capturing sediment behind dams deprives river deltas of the regular influx of nutrients in organic matter that supports the carbon-rich wetlands and tidal flats the river deltas contain. Simply "moving carbon around" in such accounting systems can become a shell game that obscures the actual ecosystem and climate impacts of projects.

At best, accounting for carbon stocks with such a narrow system boundary or time-scale attaches carbon accrual benefits to projects upstream while depriving carbon accrual elsewhere in the ecosystem. At worst, it ignores the fact that a significant amount of the ecosystem carbon captured in sediment behind dams becomes the dangerous greenhouse gas methane—emissions that largely would not have occurred had rivers' natural flow regime and hydrologic processes not been severely disrupted by dams and reservoirs.[93]

2. Total emissions are often undercounted both by models that underestimate single emissions sources, and categorical exclusions of multiple emission sources directly resulting from constructing and operating dams and reservoirs.

One source of undercounting comes from a failure to account for research showing that eutrophication, or accumulation of specific nutrients in a body of water, leads to higher methane emissions from reservoir surfaces.[94] For example, the U.S. National GHG inventory conducted

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[89] Melissa A. Ward, Tessa M. Hill, Chelsey Souza, Tessa Filipczyk, Aurora M. Ricart, Sarah Merolla, Lena R. Capece, Brady C O'Donnell, Kristen Elsmore, Walter C. Oechel & Kathryn M. Beheshti, *Blue carbon stocks and exchanges along the California coast* (2021), https://doi.org/10.5194/bg-18-4717-2021.

[90] Second State of the Carbon Cycle Report, Chapter 15: Tidal Wetlands and Estuaries. https://carbon2018.globalchange.gov/chapter/15/.

[91] Laura S. Brophy, Correigh M. Greene, Van C. Hare, Brett Holycross , Andy Lanier, Walter N. Heady, Hiroo Imaki, Tanya Haddad & Randy Dana, *Insights into estuary habitat loss in the western United States using a new method for mapping maximum extent of tidal wetlands* ("*Insights into estuary habitat loss*") (2019), PLoS ONE 14(8): e0218558, https://doi.org/10.1371/journal.pone.0218558.

[92] Zhao Liang Chen & Shing Yip Lee, *Tidal Flats as a Significant Carbon Reservoir in Global Coastal Ecosystems I* ("*Tidal Flats as a Significant Carbon Reservoir*") (2022), Frontiers in Marine Science 9, https://www.frontiersin.org/articles/10.3389/fmars.2022.900896.

[93] Gerard Rocher-Ros, Emily H. Stanley, Luke C. Loken, Nora J. Casson, Peter A. Raymond, Shaoda Liu, Giuseppe Amatulli & Ryan A. Sponseller, *Global Methane Emissions from Rivers and Streams*, Nature 621, no. 7979 (September 21, 2023): 530–35, https://doi.org/10.1038/s41586-023-06344-6.

[94] Deemer et al., *Greenhouse Gas Emissions: Reservoir Water Surfaces,* 949–64, https://doi.org/10.1093/biosci/biw117.

by USEPA does not take eutrophication into account in its estimate of reservoir emissions.[95] The IPCC 2019 refinement's general methane emission for reservoir surfaces takes eutrophication into account to a degree, but the IPCC 2019's emission factors are significantly smaller than those described by other sources.[96, 97] Reservoir eutrophication is a major problem in the United States, and it affects the great majority of waterways and reservoirs, including in California.[98, 99, 100]

Warming temperatures and eutrophication of water bodies significantly increase surface emissions as well as methane in the deep, anoxic zones from which reservoir bypass systems and turbine facilities typically draw water.[101] The more eutrophication and warming that occurs, the greater the GHG emissions.[102] Moreover, a warming climate produces a positive feedback loop that exacerbates the problem.[103]

Another source of undercounting results from the failure to adequately address offgassing of methane downstream from hydroelectric turbines at hydropower facilities.[104] Some studies note that emissions downstream of turbines are often comparable to or greater than the reservoir surface emissions.[105] Methane emissions from hydroelectric turbines installed in dams and driven by stored reservoir water have been widely reported and summarized in review papers and

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[95] U.S. Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2022, U.S. Environmental Protection Agency, EPA 430-R-24-004 (2024), https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2022

[96] Deemer et al., *Greenhouse Gas Emissions: Reservoir Water Surfaces*, 949–64. https://doi.org/10.1093/biosci/biw117.

[97] Rosentreter et al., *Half of Global Methane Emissions* at 225–30, https://doi.org/10.1038/s41561-021-00715-2.

[98] Walter Dodds, Wes W. Bouska, Jeffrey L. Eitzmann, Tyler J. Pilger, Kristen L. Pitts, Alyssa J. Riley, Joshua T. Schloesser & Darren J. Thornbrugh, *Eutrophication of U.S. Freshwaters: Analysis of Potential Economic Damages*, 43 Envtl. Sci. & Tech. 13 (2009), https://pubs.acs.org/doi/10.1021/es801217q.

[99] US Environmental Protection Agency, National Lakes Assessment for 2012 (2016), https://www.epa.gov/sites/default/files/2016-12/documents/nla_report_dec_2016.pdf.

[100] California State Water Resources Control Board, *Surface Water – Freshwater Harmful Algal Blooms* (2024), https://data.ca.gov/dataset/surface-water-freshwater-harmful-algal-blooms.

[101] Rosentreter et al., *Half of Global Methane Emissions* at 225–30, https://doi.org/10.1038/s41561-021-00715-2.

[102] Deemer et al., *Greenhouse Gas Emissions: Reservoir Water Surfaces*, 949–64. https://doi.org/10.1093/biosci/biw117.

[103] Cynthia Soued, John A. Harrison, Sara Mercier-Blais & Yves T. Prairie, *Reservoir CO2 and CH4 emissions and their climate impact over the period 1900–2060*, Nat. Geosci. 15, 700-705 (2022), https://doi.org/10.1038/s41561-022-01004-2.

[104] Cuihong Song, Kevin H. Gardner, Sharon J.W. Klein, Simone Pereira Souza & Weiwei Mo, *Cradle-to-Grave Greenhouse Gas Emissions from Dams in the United States of America* ("*Cradle-to-Grave Greenhouse Gas Emissions*"), Renewable and Sustainable Energy Reviews 90 (July 2018): 945–56, https://doi.org/10.1016/j.rser.2018.04.014.

[105] Kyle B. Delwiche, John A. Harrison, Joannes D. Maasakkers, Melissa P. Sulprizio, John Worden, Daniel J. Jacob & Elsie M. Sunderland, *Estimating Driver and Pathways for Hydroelectric Reservoir Methane Emissions Using a New Mechanistic Model*. Journal of Geophysical Research-Biogeosciences 127, no. 8 (August 2022), https://doi.org/10.1029/2022JG006908.

descriptions of mechanistic models for those emissions.[106, 107, 108, 109] These turbine and reservoir systems qualify as specific GHG-emitting "facilities" under CARB's regulatory definition.[110]

Additional undercounting is caused by failures to examine significant human-caused biogenic methane emissions[111] from reservoir sediments during either the inevitable dam decommissioning process at the end of dams' and reservoirs' life span, or periodic sediment flushing. A 2007 paper on methane emissions from sediments at the time of decommissioning predicted significantly large emissions of human-caused biogenic methane stored in reservoir sediments, along with additional human-caused biogenic methane from microbial decomposition of sediment organic matter stimulated by the decommissioning process.[112] Studies of methane emissions from sediments during the decommissioning process confirm this prediction.[113, 114, 115, 116]

Undercounting also results from failing to address land use and land cover change directly attributable to dam construction. The opportunity cost of lost carbon sequestration when ecosystems are inundated under new reservoirs is not addressed in existing regulations. For

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[106] *Id*.

[107] Song et al., *Cradle-to-Grave Greenhouse Gas Emissions,* https://doi.org/10.1016/j.rser.2018.04.014.

[108] Yves T. Prairie, Jukka Alm, Jake Beaulieu, Nathan Barros, Tom Battin, Jonathan Cole, Paul del Giorgio, Tonya DelSontro, Frédéric Guérin, Atle Harby, John Harrison, Sara Mercier-Blais, Dominique Serça, Sebastian Sobek & Dominic Vachon, *Greenhouse Gas Emissions from Freshwater Reservoirs: What Does the Atmosphere See*? Ecosystems 21, no. 5 (August 2018): 1058–71, https://doi.org/10.1007/s10021-017-0198-9.

[109] *IPCC 2019 Refinement Report,* Chapter 7: Wetlands, https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/4_Volume4/19R_V4_Ch07_Wetlands.pdf.

[110] Cal. Code Regs., tit. 17, § 95102; see fn. 17.

[111] Much of the scientific literature describes GHG emissions from reservoir sediments as "biogenic," in the sense that the emissions result from decomposition of organic materials. When this petition uses the term "biogenic" to describe such emissions, it does so solely in this sense. That said, these emissions should be considered "anthropogenic" for purposes of monitoring and reporting, because the emissions would not have occurred (or would have occurred differently) absent human construction of dams and reservoirs. CARB should not dismiss GHG emissions attributable to human construction and operation of dams and reservoirs because they are in some scientific sense "biogenic." This petition uses the term "human-caused biogenic" to describe such emissions.

[112] Sergio Pacca, *Impacts from Decommissioning of Hydroelectric Dams: A Life Cycle Perspective*, Climatic Change 84, no. 3–4 (August 20, 2007): 281–94, https://doi.org/10.1007/s10584-007-9261-4.

[113] Mabano Amani, Daniel von Schiller, Isabel Suárez, Miren Atristain, Arturo Elosegi & Rafael Marcé, *The Drawdown Phase of Dam Decommissioning Is a Hot Moment of Gaseous Carbon Emissions from a Temperate Reservoir*, Inland Waters 12, no. 4 (October 2, 2022): 451–62, https://doi.org/10.1080/20442041.2022.2096977.

[114] Wentao Liang, Xinyu Liu, Xixi Lu, Ruihong Yu, Zhen Qi & Hao Xue, *Impact of Dam Decommissioning on Greenhouse Gas Emissions from a Reservoir: An Example from the Inner Mongolia Grassland Region, China*, Journal of Hydrology 631 (March 2024): 130750, https://doi.org/10.1016/j.jhydrol.2024.130750.

[115] Mabano Amani, Biel Obrador, David Fandos, Andrea Butturini, and Daniel Von Schiller, *Exposed Sediments in a Temperate-Climate Reservoir under Dam Decommissioning Contain Large Stocks of Highly Bioreactive Organic Matter*, Limnetica 43, no. 1 (May 31, 2023): 1, https://doi.org/10.23818/limn.43.11.

[116] Margariete Malenda, Thomas Betts, Wendy Simpson, Michael Wizevich, Edward Simpson & Laura Sherrod, *Methane emissions from muds during low water-level stages of Lake Powell, southern Utah, USA*: Geology of the Intermountain West (2020), v. 7, p. 121-136, https://doi.org/10.31711/giw.v7.pp121-136.

example, consider the carbon sequestration occurring at restored dam sites in the United States. The Elwha River watershed in the Olympic Peninsula and the White Salmon River watershed in the Columbia River Gorge are estimated to be sequestering 6,023 and 286 metric tons CO_2e per year, respectively, as forests and vegetation reclaim the formerly inundated sites.[117] The dam footprints of the formerly dammed Elwha and White Salmon rivers likely held biomass carbon stocks equal to or greater than 1.2 million metric tons CO_2e before they were inundated. This does not include the carbon in the soils of these forests, which would likely double the total ecosystem carbon stocks.

A significant source of undercounting may also exist due to river diversions and reservoir surface evaporation, combined with disrupted hydrologic cycles, that impact downstream riparian- and estuarian-associated ecosystems. "Blue carbon" reserves in estuaries contain some of the highest carbon stocks of any ecosystem on earth, yet they are steadily declining due to dam construction and river diversions.[118, 119, 120, 121, 122] For example, the proposed Sites Reservoir in the Sacramento River watershed is projected to lead to a loss of at least 1% of the wetland area in the Sacramento-San Joaquin River Delta, which would equate to a carbon stock of more than 81,000 metric tons CO_2e per year.[123] As another example, the Colorado River delta historically contained more than two million acres of wetlands, riparian forests, and carbon-rich tidal flats. After more than a century of dam construction, river diversions, and evaporation from reservoir surfaces, less than 10% of that area now contains wetlands and riparian forests, nearly all which are now degraded. Based on a conservative estimate of the carbon and nitrogen stocks in those systems, the total ecosystem carbon and nitrogen loss exceeds one billion metric tons CO_2e.[124] This estimate does not include degraded riparian forests and riparian-associated wetlands in the watershed upstream of the delta.

Beyond these additional GHG emission points, the full carbon footprint and climate impact of dam and reservoirs may be far greater due to the millions of acres of destroyed and submerged forests, grasslands, soil, and farmlands. Greenhouse gas emissions from land use

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[117] *See* U.S. Department of Agriculture, COMET-Farm, https://comet-farm.com (last visited Nov. 23, 2021).

[118] Ward et al., *Blue carbon stocks and exchanges along the California coast*, https://doi.org/10.5194/bg-18-4717-2021.

[119] Second State of the Carbon Cycle Report Chapter 15: Tidal Wetlands and Estuaries, https://carbon2018.globalchange.gov/chapter/15/.

[120] Brophy et al., *Insights into estuary habitat loss*, https://doi.org/10.1371/journal.pone.0218558.

[121] Chen et al., *Tidal Flats as a Significant Carbon Reservoir*, https://www.frontiersin.org/articles/10.3389/fmars.2022.900896.

[122] Yuanyuan Huang, Phillipe Ciais, Yiqi Luo, Dan Zhu, Yingping Wang, Chunjing Qiu, Daniel S. Goll, Bertrand Guenet, David Makowski, Inge De Graaf, Jens Leifeld, Min Jung Kwon, Jing Hu & Laiye Qu, Tradeoff of CO2 and CH4 emissions from global peatlands under water-table drawdown, Nature Climate Change 11 (2021): 618-622 https://www.nature.com/articles/s41558-021-01059-w.

[123] Wockner et al., *Estimate of Greenhouse Gas Emissions: Sites Reservoir Project,* https://tellthedamtruth.com/wp-content/uploads/2023/08/Sites-Reservoir-Projectect-Emissions-V4.pdf.

[124] *See* Pete Smith & Mercedes Bustamante, Chapter 11, Agriculture, Forestry and Other Land Use (AFOLU), in *Climate Change 2014, Mitigation of Climate Change* (2014), https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter11.pdf.

change are well understood and documented by the EPA in its existing national inventory,[125] though the vast majority of the land use change that occurred from constructing dams and filling reservoirs occurred prior to the EPA inventory baseline year of 1990. These lands sequester carbon, and inundating these lands by constructing a dam and reservoir eliminates these carbon sinks. The collective carbon footprint of dams and reservoirs therefore is expected to be much higher than the surface GHG emissions alone.

Methodology matters for these under-estimates. Some hydropower industry-affiliated studies have used or endorsed methodologies that estimate lower GHG emissions from dams and reservoirs.[126] These methods omit crucial components of life cycle emissions, such as elements of dam construction, decommissioning, lost carbon sequestration opportunities, losses of downstream ecosystem carbon due to hydrologic disruption, and carbon leakage due to land use change.[127] Despite their flaws, however, none of these studies disputes the central point that dams and reservoirs emit significant amounts of GHGs.

E. Federal agencies, states, utilities, and other stakeholders often incorrectly claim that dams and reservoirs have no greenhouse gas emissions.

While the science has clearly and consistently shown that dam and reservoir systems cause substantial annual GHG emissions, neither federal nor California state agencies operating dams and reservoirs in the United States count or report these emissions. Moreover, federal agencies, states, utilities, and other stakeholders often mistakenly claim that dams and reservoirs have no GHG emissions, and that hydropower is a low- or zero-carbon electricity source. California is no exception.

Federal agencies

Numerous federal agencies incorrectly characterize hydropower as a clean energy resource. For example, the Bonneville Power Administration repeatedly describes hydropower as "clean" in its 2024 Annual Report."[128] Similarly, the Bureau of Reclamation's hydropower website claims that "[h]ydropower is a renewable and reliable resource providing clean energy to the western United States."[129] Reclamation's statement, however, disregards the fact that it

[125] U.S. Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks (2021), https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks (last visited January 1, 2022).

[126] *See, e.g.*, A. Levasseur, S. Mercier-Blais, Y.T. Prairie, A. Tremblay & C. Turpin, *Improving the accuracy of electricity carbon footprint: Estimation of hydroelectric reservoirs greenhouse gas emissions*, 136 Renewable & Sustainable Energy Reviews (2021), https://www.sciencedirect.com/science/article/pii/S1364032120307206.

[127] Song et al. 2018. *Cradle-to-Grave Greenhouse Gas Emissions from dams in the United States of America*. Renewable and Sustainable Energy Reviews 90:945-956. https://www.sciencedirect.com/science/article/abs/pii/S1364032118302235.

[128] Bonneville Power Admin. 2024, Annual Report. Powering a clean energy future. https://www.bpa.gov/-/media/Aep/finance/annual-reports/ar2024.pdf (last visited October 6, 2025).

[129] Bureau of Reclamation, Hydropower Program, https://www.usbr.gov/power/ (last visited October 15, 2021).

operates Powell Reservoir and Glen Canyon Dam, which emit approximately 1.8 million metric tons of CO_2e annually.[130]

California

Despite California's ambitious climate goals, the state has also overlooked dams' and reservoirs' GHG emissions, and has mistakenly claimed that hydropower is a clean energy resource. California asserts that hydropower is one of the "renewable energy resources [it uses] to meet its clean energy goals, combat climate change, and promote sustainable energy use," and counts small hydropower plants toward the state's Renewable Portfolio Standard.[131] And, as noted above, "[e]lectricity generating facilities that are solely powered by … hydroelectric … energy" with on-site stationary combustion emissions that equal or exceed 10,000 metric tons of CO_2e are explicitly exempt from reporting requirements under the MRR.[132]

Beyond hydropower, California commonly overlooks GHG emission sources from dams and reservoirs when it reviews water supply and dam management projects. For example, the environmental impact analysis for the proposed Sites Reservoir project in the Sacramento River Watershed included only emissions from burning fossil fuels and manufacturing cement for the construction of the reservoir, and emissions from generating energy required to operate the reservoir for its life cycle.[133] The analysis did not address the human-caused biogenic emissions as described above, and only acknowledged the presence of human-caused biogenic emissions in a partial response to criticism provided by non-governmental advocacy groups.

Industry and utilities

Private utilities providing power to California make similar claims about dams and reservoirs. California's Pacific Gas and Electric Company touts its reliance on both "small hydroelectric generation" and "large hydroelectric power" as part of its "100% greenhouse gas-free electricity" portfolio, and insists its "hydroelectric system provides safe, reliable and clean energy."[134] [135] Southern California Edison's November 2019 white paper entitled, "Pathway

[130] Wockner et al., *Estimate of Greenhouse Gas Emissions: Glen Canyon and Hoover Dam Facilities*, https://tellthedamtruth.com/wp-content/uploads/2024/09/Powell-Mead-Combined-All-Res-Final-Draft-9-11-2024.pdf.

[131] Cal. Energy Comm'n, Renewable Energy Resources, https://www.energy.ca.gov/programs-and-topics/topics/renewable-energy/renewable-energy-resources (last visited Mar. 15, 2024).

[132] MRR § 95101(f)(1).

[133] Sites Project Authority. 2023. Final Environmental Impact Report/Environmental Impact Statement. https://sitesproject.org/final-environmental-impact-report/.

[134] Press Release, Pacific Gas and Electric Corporation, "PG&E Customers' Electricity 100% Greenhouse Gas-Free in 2023" (April 22, 2024), https://investor.pgecorp.com/news-events/press-releases/press-release-details/2024/PGE-Customers-Electricity-100-Greenhouse-Gas-Free-in-2023/default.aspx#:~:text=PG%26E%20also%20owns%20430%20megawatts,in%20helping%20customers%20go%20solar.

[135] PG&E Systems: Hydroelectric system, https://www.pge.com/en/about/pge-systems/hydroelectric-system.html#:~:text=Our%20hydroelectric%20system%20provides%20safe,hydroelectric%20system%20in%20the%20nation.

2035: Update to the Clean Power and Electrification Pathway," identifies hydropower as a type of "carbon-free electricity."[136]

The hydropower industry also regularly repeats the false claim that hydropower is a clean energy resource. The National Hydropower Association states that hydropower is "clean, renewable energy," and that hydropower "provides clean, carbon-free energy."[137] The International Hydropower Association claims that pumped storage hydropower is an "ideal complement to modern clean energy systems."[138] Multiple news articles have also repeated industry claims that pumped storage hydropower is critical to the clean energy future.[139]

Other stakeholders

Various other entities and stakeholders also frequently overlook GHG emissions from dams and reservoirs. For example, media coverage of the August 2021 IPCC report highlighting methane emissions often discussed the significant methane emissions from oil and gas production and agriculture while failing to mention the large amounts of methane emissions from dams and reservoirs.[140] Similarly, a recent McKinsey research report regarding methane claimed that five industries are responsible for 98% of anthropogenic methane emissions: agriculture, oil and gas, coal mining, solid-waste management, and wastewater management.[141] This claim is likely incorrect, as the 2020 Beaulieu *et al*. study estimated that dams and reservoirs are the fourth largest source of anthropogenic methane emissions in Ohio.[142] The McKinsey research made no mention of methane emissions from dams and reservoirs.

Perhaps the most telling example of how stakeholders overlook dams' and reservoirs' methane emissions is The Climate Registry's Water-Energy Nexus Registry. The Climate Registry is a non-profit organization that various states and Canadian provinces advise, and it

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[136] Southern California Edison, Pathway 2045: Update to the Clean Power and Electrification Pathway (November 2019) 5, https://download.newsroom.edison.com/create_memory_file/?f_id=5dc0be0b2cfac24b300fe4ca&content_verified=True.

[137] National Hydropower Association, https://www.hydro.org/ (last visited October 15, 2021).

[138] International Hydropower Association, Pumped storage hydropower, https://www.hydropower.org/factsheets/pumped-storage (last visited October 15, 2021).

[139] *See, e.g.*, Power Engineering International, *Pumped storage hydropower critical for future clean energy systems* (September 20, 2021), https://www.powerengineeringint.com/smart-grid-td/energy-storage/pumped-storage-hydropower-critical-for-future-clean-energy-systems/; Sammy Roth, *Environmental disaster or key to a clean energy future? A new twist on hydropower*, L.A. Times (March 5, 2020), https://www.latimes.com/environment/story/2020-03-05/is-hydropower-key-to-a-clean-energy-future.

[140] *See, e.g.*, Rebecca Leber, *It's time to freak out about methane emissions*, Vox (August 12, 2021), https://www.vox.com/22613532/climate-change-methane-emissions.

[141] McKinsey Sustainability, *Curbing methane emissions: How five industries can counter a major climate threat* (September 23, 2021), https://www.mckinsey.com/business-functions/sustainability/our-insights/curbing-methane-emissions-how-five-industries-can-counter-a-major-climate-threat.

[142] Beaulieu et al., *Methane and Carbon Dioxide Emissions From Reservoirs*, https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2019JG005474.

offers programs for businesses and other organizations to voluntarily measure and report their GHG emissions.[143] In 2019, The Climate Registry launched a Water-Energy Nexus Registry, which focuses on California water providers.[144] The Water-Energy Nexus Registry correctly recognizes that water supply systems cause substantial GHG emissions, and provides a voluntary registry for water providers to measure and report their systems' GHG emissions.[145] The registry claims its program allows water providers to calculate and track their carbon footprint. But the registry only measures and reports the GHG emissions resulting from the energy used to pump and transport water. The registry does not measure or account for reservoir surface emissions, or most of the other emission points from dams and reservoirs discussed above. Consequently, this registry that purports to quantify the carbon footprint of water supply systems overlooks a significant portion of water providers' actual GHG emissions.

CARB'S LEGAL AUTHORITY TO REQUIRE REPORTING OF GREENHOUSE GAS EMISSIONS FROM DAMS AND RESERVOIRS

CARB has the legal authority to require reporting of GHG emissions from dam and reservoir systems. AB 32 explicitly requires CARB "to adopt regulations to require the reporting and verification of statewide greenhouse gas emissions and to monitor and enforce compliance with this program."[146] The California Legislature has tasked CARB with "[r]equiring the monitoring and annual reporting of greenhouse gas emissions from greenhouse gas emission sources" and "ensur[ing] rigorous and consistent accounting of emissions."[147] Further, the law states that CARB "shall … [p]eriodically review and update its emission reporting requirements, as necessary."[148] Thus, not only is CARB legally authorized to revise the MRR to include dams and reservoirs, but it is required to make these kinds of updates.

Moreover, requiring reporting of GHG emissions from dams and reservoirs is consistent with CARB's mission "to promote and protect public health, welfare, and ecological resources through the effective and efficient reduction of air pollutants while recognizing and considering the economy of the State."[149] As Governor Newsom has noted, "[n]o challenge poses a greater

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[143] The Climate Registry, About Us, https://theclimateregistry.org/about/ (last visited October 15, 2024).

[144] *Id.,* Water-Energy Nexus Registry, https://theclimateregistry.org/registries-resources/water-energy-nexus/ (last visited October 6, 2025).

[145] *Id.,*, Water-Energy Nexus Registry, https://www.theclimateregistry.org/programs-services/california-water-energy-nexus-registry/ (last visited October 15, 2021

[146] Cal. Health and Safety Code § 38530(a).

[147] *Id.* § 38530(b)(1), (4).

[148] *Id.* § 38530(c)(1).

[149] California Air Resources Board, Enforcement Policy (April 2020), https://ww2.arb.ca.gov/resources/documents/enforcement-policy#:~:text=CARB%20adopts%20regulations%20designed%20to,the%20requirements%20of%20each%20regulation

threat to our way of life, prosperity, and future as a state than climate change."[150] Requiring reporting of GHG emissions from dams and reservoirs will help California's leaders better understand these harmful impacts and make more informed, accurate choices about California's energy future and the energy sources in which the state invests.

AB 32 has given CARB a clear duty to reduce California's greenhouse gas emissions to help prevent climate change and its devastating impacts on California's future. As the Legislature noted, climate change "[p]oses a serious threat to the economic well-being, public health, natural resources, and the environment of California."[151] Where, as here, a significant source of GHG emissions is going unreported and unconsidered, CARB must take action to revise its reporting regulations, add dams and reservoirs to the MRR, and provide California decisionmakers with a more complete picture of the state's GHG emitters. Only then can California's leaders and agencies make the decisions, laws, and policies that will best achieve the state's GHG targets.

BENEFITS OF INCLUDING DAMS AND RESERVOIRS IN CARB'S GHG MANDATORY REPORTING REGULATIONS

The Petitioners request that CARB grant this Petition and promptly initiate a rulemaking to list dams and reservoirs as reporting entities that must report GHG emissions under the MRR.[152] Dams and reservoir systems, including all components such as turbines, spillways, and outlet tubes, are GHG-emitting "facilities" under CARB's regulatory definition.[153] CARB should grant this Petition and expand the scope of the MRR because dams and reservoirs emit substantial amounts of GHGs each year that are currently underreported and ignored. Accordingly, expanding the MRR to include dams and reservoirs will result in more accurate GHG emissions data from a long-overlooked source category of substantial GHG emissions. This additional data would result in increased awareness of GHG emissions from dams and reservoirs and better-informed climate policies at the state and local levels.

When CARB implemented the MRR in 2008, it recognized it would likely need to expand the program in the future by adding new source categories. Yet CARB has not added any source categories since 2016. This Petition provides CARB with a timely opportunity to expand the MRR so that regulators, policymakers, and the public will have access to important new data regarding this significant source category of GHG emissions.

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[150] Press Release, Office of Governor Gavin Newsom, "Governor Newsom Joins Groundbreaking for World's Largest Wildlife Crossing as State Launches Nature-Based Strategies to Fight Climate Change and Protect Biodiversity" (April 22, 2022), https://www.gov.ca.gov/2022/04/22/governor-newsom-joins-groundbreaking-for-worlds-largest-wildlife-crossing-as-state-launches-nature-based-strategies-to-fight-climate-change-and-protect-biodiversity/.

[151] Cal. Health and Safety Code § 38501(a).

[152] Cal. Government Code § 11340.6; Cal. Health and Safety Code § 38530(c)(1).

[153] Cal. Code Regs., tit. 17, § 95102.

I. Adding dams and reservoirs to the MRR will result in better-informed California climate policies by ensuring that dams and reservoirs' GHG emissions are no longer underreported and ignored.

The collective GHG emissions of all dams and reservoirs across California are underreported and disregarded. Nationally, methane emissions from dam and reservoir surfaces are comparable to the methane emissions from the production and distribution of fossil fuels.[154] Moreover, the overall CO_2e emissions from reservoir surfaces are comparable to the CO_2e emissions from the entire U.S. agricultural sector and home energy use in the United States. *See supra* p. 15. Extrapolating from these studies, there is every reason to suspect that these emissions from California dam and reservoir surfaces are significant as well. But California does not require dam and reservoir systems' consequential GHG emissions to be measured or reported.

Because dam and reservoir facilities are not required to measure or report their annual GHG emissions, ignoring these emissions is the current status quo. California agencies, utilities, and other stakeholders too often assume that hydropower is a low- or zero-carbon resource, when that assumption is unfounded and incorrect. *See supra* pp. 2-3, 22. Leaving the GHG emissions from dams and reservoirs "off the books" in this manner has given California agencies, utilities, and private energy developers license to expand hydropower development, despite the substantial body of scientific research showing that dams and reservoirs are major contributors to the climate crisis.

This Petition seeks to rectify the omission of dam and reservoir GHG emissions from California's inventories, so that CARB and other agencies and stakeholders can utilize accurate science and emissions data when they make decisions concerning the construction, operation, regulation, and decommissioning of dams in California. Adding dams and reservoirs to the MRR will ensure that policymakers and the public have access to greater and more accurate information regarding this significant source category of GHG emissions. This additional and improved emissions data will be a critical first step toward developing more well-informed policies on climate change, hydropower, and river management. GHG emissions data will also help ensure that California's government does not provide funding for dam and reservoir facilities with GHG emissions that will frustrate California's climate goals.

Similarly, water storage investments that utilize dams and reservoirs, rather than groundwater storage, may result in significantly higher GHG emissions and lost carbon capture opportunities. But this essential information is lacking for dams and reservoirs. CARB should therefore grant this Petition and promptly initiate a rulemaking to list dams and reservoirs as a source category under the MRR.

[154] Tell the Dam Truth, "Petition for rulemaking to add dams and reservoirs as a source category under the Greenhouse Gas Reporting Program," at 13 (March 21, 2022), https://tellthedamtruth.com/wp-content/uploads/2022/03/Petition-for-rulemaking-to-add-dams-and-reservoirs-as-a-source-category-under-the-Greenhouse-Gas-Reporting-Program.pdf.

II. Adding dams and reservoirs to the MRR will help prevent the ill-informed expansion of hydropower based on the mistaken assumption that hydropower is a carbon-free electricity source.

The August 2021 IPCC reports and the recent wildfires, hurricanes, and drought that have battered the United States have all vividly highlighted the climate crisis and the need to take prompt actions to further reduce GHG emissions. California has set a goal of achieving "carbon neutrality as soon as possible," with "no negative emissions thereafter."[155] Recent legislation requires California's agencies to create a plan for all of California's retail sales of electricity to come from renewable energy resources and zero carbon resources by December 31, 2045.[156]

As California determines how it will decarbonize the electric sector, and especially as it considers funding incentives, tax credits, and streamlined environmental review, it is imperative that the state accurately account for the GHG emissions of various generation resources. The GHG emissions from coal- and gas-fired power plants, wind, and solar are well understood. In contrast, the GHG emissions from hydropower facilities are typically not recognized and not quantified. Even more problematically, California agencies and utilities almost uniformly assume that hydropower is a clean and zero-carbon generation resource. But that is not true for many hydropower facilities. California should not continue to make important and long-lasting decisions regarding the future of the electric sector based on incomplete and incorrect information that ignores hydropower's GHG emissions.

Granting this Petition and adding dams and reservoirs to the MRR will help ensure that California's leaders, agencies, and utilities no longer mistakenly presume that hydropower is a clean energy resource. The core problem is the lack of awareness of dams and reservoirs' GHG emissions. Increasing awareness and understanding of GHG emissions is precisely the point of the MRR.[157] This is a pivotal time to ensure that California's leaders, agencies, and utilities have access to accurate and timely information, based on the best available science, regarding hydropower's GHG emissions. **If regulators and policymakers continue to disregard or undercount the GHG emissions from the dams and reservoirs used for hydropower generation, California runs the risk of inadvertently pursuing a "clean" electric sector that is not actually clean.**

Given the imperative to promptly reduce GHG emissions, California cannot afford to make ill-informed and mistaken decisions regarding hydropower's role in a zero-carbon future, particularly when data on hydropower's GHG emissions can be calculated but these facilities are not required to measure and report their emissions. CARB should therefore grant this Petition and ensure that California's leaders, agencies, utilities, and other stakeholders have access to the

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[155] California Governor's Office, Executive Order B-55-18 (September 10, 2018), https://archive.gov.ca.gov/archive/gov39/wp-content/uploads/2018/09/9.10.18-Executive-Order.pdf; Cal. Health and Safety Code § 38562.2(c)(1). As discussed above, "human-caused biogenic" emissions from dam and reservoir systems that would not have occurred absent human activity should be monitored, reported and counted as "anthropogenic" for purposes of California's climate goals.

[156] Cal. Public Utilities Code § 454.53(a).

[157] Cal. Health & Safety Code § 38530(b)(1).

best available information on dams and reservoirs' GHG emissions as they make crucial decisions regarding the electric sector's future.

III. Adding dams and reservoirs to the MRR will assist California in achieving its Subnational Methane Pledge.

In August 2021, the IPCC issued a report highlighting methane's contribution to climate change and the need to promptly reduce methane emissions.[158] In October 2021, the United States announced that it will join the Global Methane Pledge to reduce methane emissions 30% by 2030, and more than one-hundred governments have now joined the pledge.[159] As noted above, Governor Newsom issued a September 2023 press release launching a new pledge for governments around the world to commit to reducing global methane emissions.[160] This pledge—aimed at subnational governments like California—builds on the Global Methane Pledge. The Subnational Methane Pledge echoes California's previous commitments to reduce its 2013 methane levels by 40% by 2030.[161] California has also passed legislation requiring CARB to develop a comprehensive strategy to reduce emissions of short-lived climate pollutants like methane, including development of an inventory of sources and emissions.[162] To date, CARB's nascent climate pollutant strategies to reduce methane have largely focused on sources like dairy and livestock, landfills, wastewater, and oil and gas.[163]

As this Petition, Attachment 2, and the cited materials demonstrate, dams and reservoirs emit large amounts of methane. Individual dams and reservoirs can emit substantial amounts of methane annually, and the collective methane emissions of all dams and reservoirs across the United States are exceedingly large. But, again, these methane emissions from dams and reservoirs are mostly overlooked and ignored.

As Governor Newsom recently explained, "We're partnering with governments around the world to tackle methane emissions…By working together on strategies informed by science, like deploying methane detection satellites, we can help address this global threat."[164] But this

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[158] *See supra* pp. 7-8; Matt McGrath, *Climate Change: Curbing Methane Emissions Will 'Buy Us Time*,*'* BBC News (Aug. 11, 2021), https://www.bbc.com/news/science-environment-58174111.

[159] Lisa Friedman, *More Than 30 Countries Join U.S. Pledge to Slash Methane Emissions*, N.Y. Times (October 11, 2021), https://www.nytimes.com/2021/10/11/climate/methane-global-climate.html; Fact Sheet, The White House, "President Biden Tackles Methane Emissions, Spurs Innovations, and Supports Sustainable Agriculture to Build a Clean Energy Economy and Create Jobs" (November 2, 2021), https://www.whitehouse.gov/briefing-room/statements-releases/2021/11/02/fact-sheet-president-biden-tackles-methane-emissions-spurs-innovations-and-supports-sustainable-agriculture-to-build-a-clean-energy-economy-and-create-jobs/.

[160] Press Release, Office of Governor Gavin Newsom, "California Enlists Governments Around the World to Fight Methane Pollution" (September 20, 2023), https://www.gov.ca.gov/2023/09/20/california-enlists-governments-around-the-world-to-fight-methane-pollution/.

[161] Cal. Health and Safety Code § 39730.5(a).

[162] Cal. Health and Safety Code § 39730.

[163] *See* California Air Resources Board, Short-Lived Climate Pollutant Reduction Strategy" (March 2017), https://ww2.arb.ca.gov/sites/default/files/2020-07/final_SLCP_strategy.pdf.

[164] Press Release, Office of Governor Gavin Newsom, see supra note 154.

requires better data regarding methane emissions, built on honest reporting from state agencies and industry. Indeed, a 2021 *Washington Post* investigation found that countries around the world collectively underreport their methane emissions by 57 million to 76 million tons, and that this underreporting of methane emissions (and other GHGs) presents a significant hurdle to achieving climate goals.[165] With the current federal administration moving away from climate science, it is up to California to take the lead on this issue.

To effectively reduce California's methane emissions, and those of the nation, it is imperative that CARB and other state agencies understand the contribution of methane emissions from dams and reservoirs. Granting this Petition and adding dams and reservoirs to the MRR would further that goal and help ensure that California's government possesses accurate and timely information on dams and reservoirs' methane emissions as it determines how it will meet its Subnational Methane Pledge and its own nascent climate pollutant targets. California will be better positioned to achieve this goal if it understands the relative contribution of methane emissions from dams and reservoirs compared to other source categories. As CARB stated when it first developed the MRR, "the data collected [through this mandatory reporting] will improve California's GHG inventory, provide a mechanism to track emissions trends, and support emission reduction strategies. The regulation is a central component of our efforts to quantify, evaluate, and reduce greenhouse gas emissions."[166] Moreover, the data regarding methane emissions from individual dams and reservoirs may illustrate additional ways California can achieve its methane goals, such as decommissioning certain high-emitting facilities. Granting this petition will thus help ensure that California has access to the best available information on methane emissions from dams and reservoirs as it determines how it will reduce its methane emissions by 40% in 2030 compared to 2013 levels.[167]

CONCLUSION

The time to take prompt and decisive action on climate change is now. Every day that dams and reservoirs continue to emit large amounts of GHGs that go uncounted and unreported is a missed opportunity to better understand and address this significant source of GHG emissions. Moreover, every day that California's leaders, agencies, and utilities incorrectly assume and state that all hydropower is a low- or zero-carbon resource—or that reservoir water storage has no GHG emissions—California goes further down the path of making pivotal and long-lasting decisions regarding electricity and water based on mistaken assumptions. Continuing these erroneous assumptions and ill-informed decisions will have dire climate and

[165] Chris Mooney et al., *Countries' Climate Pledges Built on Flawed Data, Post Investigation Finds*, Wash. Post (Nov. 7, 2021), https://www.washingtonpost.com/climate-environment/interactive/2021/greenhouse-gas-emissions-pledges-data/.

[166] Staff Report: Initial Statement of Reasons for Rulemaking, California Air Resources Board, Mandatory Reporting of Greenhouse Gas Emissions Pursuant to the California Global Warming Solutions Act of 2006 (Assembly Bill 32) (October 19, 2007), https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2007/ghg2007/isor.pdf.

[167] Press Release, California Air Resources Board, "California launches methane-cutting effort with subnational governments at COP28" (last visited June 30, 2024), https://ww2.arb.ca.gov/news/california-launches-methane-cutting-effort-subnational-governments-cop28#:~:text=California%20set%20a%20goal%20to,monitor%20for%20large%20methane%20plumes.

ecological consequences. For these reasons, the Petitioners strongly urge CARB to grant this Petition and promptly initiate a rulemaking to add dams and reservoirs as a source category under the MRR.

We look forward to your prompt reply to this Petition, no later than 45 days from today. If you have any questions about this Petition, please contact Gary Wockner at info@tellthedamtruth.com or 970-218-8310.

Sincerely,

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Gary Wockner
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