Docket No.: A.22-09-018
Exhibit No.: CHRC-01
Date: June 16, 2023

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Application of Pacific Gas and Electric Company (U39E) and Pacific Generation LLC for Approval to Transfer Certain Generation Assets, for a Certificate of Public Convenience and Necessity, for Authorization to File Tariffs and to Issue Debt, and for Related Determinations.	**Application 22-09-018**

PREPARED OPENING TESTIMONY OF DAVE STEINDORF

ON BEHALF OF

CALIFORNIA HYDROPOWER REFORM COALITION

JUNE 16, 2023

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The California Hydropower Reform Coalition (CHRC) submits the following testimony in the proceeding on "Application of Pacific Gas and Electric Company (U39E) and Pacific Generation LLC for Approval to Transfer Certain Generation Assets, for a Certificate of Public Convenience and Necessity, for Authorization to File Tariffs and to Issue Debt, and for Related Determinations." This testimony response to Commissioner Alice Reynolds' January 20, 2023 Scoping Memo and is timely filed and served in accordance with Administrative Law Judge Sophia J. Park's March 30, 2023 Ruling Modifying Schedule.

This testimony is provided for the Commission's consideration in determining whether the transaction as proposed by Pacific Gas and Electric Company (PG&E) is consistent with the public interest and will ensure the availability of the transferred generations to maintain the reliability of California electrical supply system, *see* Public Utilities Code §§ 851, 362, and focuses on response to specific scoping issues as described below:

- Scoping Issue 1. Whether the requests comply with applicable statutes, Commission decisions, and other legal requirements;
- Scoping Issue 2. Whether the requests are adequately justified, reasonable, and in the public interest;
- Scoping Issue 10. Impacts of the proposed transaction on the future financial condition of PG&E and Pacific Generation;
- Scoping Issue 14. Whether the proposed transaction will enable PG&E and Pacific Generation to operate and maintain utility assets safely and reliably; and
- Scoping Issue 15. Potential impacts on system reliability.

TESTIMONY OF DAVE STEINDORF

I. Introduction and Qualifications

My name is Dave Steindorf. My testimony is organized as follows: Section I provides an introduction to the organizational interests I represent and summarizes my qualifications; Section II provides an overview of my testimony; Section III describes limitations in public accessibility of dam safety information relevant to California Public Utility Commission (Commission) decision making regarding Application A.22-09-018; Sections IV and V describe specific hydroelectric generating assets proposed for transfer pursuant to Application A.22-09-018 that exemplify the concerns laid out in Section II.

Since 2005, I have worked to improve the operation of hydropower dams for environmental and recreational purposes, in my capacity as California Stewardship Director and Hydropower Specialist at American Whitewater. I come before the Commission today as an individual with more than 20 years of direct experience in hydropower licensing, working as a consultant for hydropower companies and non-governmental organizations.

During my tenure, I have been directly involved in the relicensing of more than 20 hydropower projects located throughout California. This involvement includes the development of study plans, implementation of studies, and engaging in hydropower license negotiations. I have also been engaged in the implementation of all the hydropower licenses that I helped to negotiate. In addition, I served as the Chair of the California Hydropower Reform Coalition (CHRC) for fifteen years, from 2007 through 2021, and am on the steering committee of the Hydropower Reform Coalition (HRC). In 2017, I was invited to testify before the House of Representatives Energy and Commerce Committee to educate members on the role of hydropower in energy markets and how to optimize power generation in a way that has the least impact on rivers. My curriculum vitae is provided at Attachment 1.

American Whitewater is a 501(c)(3) organization with a mission to conserve and restore America's whitewater resources and enhance opportunities to enjoy them safely. Since the 1990s, American Whitewater has actively participated in hundreds of Federal Energy Regulatory Commission (FERC) hydropower licensing and relicensing processes across the country.

In 1992, American Whitewater co-founded, and it today chairs the Steering Committee of, the HRC. The HRC is a national association of 160 national, regional, and local conservation and recreation organizations, which represent more than 1.5 million members, and actively participate in over 75% of the hydropower licensing proceedings before FERC.[1] The HRC seeks to ensure that new licenses provide energy generation and other economic benefits in a manner that contributes to the restoration of the environmental quality and recreational opportunities of affected waters, while ensuring public access to lands and waters impacted by hydroelectric facilities. American Whitewater has participated in over 100 relicensing settlement negotiations that have contributed to the economically beneficial restoration of many hundreds of miles of rivers, creeks, and other waters across the nation. Finally, American Whitewater is a member of the Steering Committee of the CHRC, an unincorporated association of thirty-six groups that represent more than 17,400 ratepayer members in PG&E's service area.[2] Founded in 1997, CHRC actively participates in 16 PG&E hydropower-licensing proceedings, as well as in various policy forums, to protect and restore California rivers affected by hydropower operations.

II. Purpose, Preliminary Conclusions, and Recommendations

I was asked by the CHRC to submit this testimony regarding Application A.22-09-018, as proposed by Pacific Gas and Electric Company (PG&E or the "Company") and PG&E Corporation. I submit this testimony in my capacity as the Hydropower Specialist for American Whitewater. In my individual capacity, and on behalf of American Whitewater and CHRC, I strongly recommend that the

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[1] The HRC Steering Committee, which functions as its Governing Board, comprises of: Alabama Rivers Alliance, American Rivers, American Whitewater, Appalachian Mountain Club, California Outdoors, California Sportfishing Protection Alliance, California Trout, Foothill Conservancy, Friends of the River, Idaho Rivers United, Michigan Hydro Relicensing Coalition, New England FLOW, South Yuba River Citizens League, and Trout Unlimited. A full list of HRC General Members is available at https://hydroreform.org/hrc-member-roster/.

[2] The CHRC Steering Committee, which functions as its Governing Board, is: American Rivers, American Whitewater, California Outdoors, California Sportfishing Protection Alliance, California Trout, Foothill Conservancy, Friends of the River, Natural Heritage Institute, Northern California Council, Federation of Fly Fishers, and Trout Unlimited. CHRC General Members are: American Rivers, American Whitewater, California Outdoors, California Trout, California Sportfishing Protection Alliance, California Wild Heritage Campaign, Center for Sierra Nevada Conservation, Central Sierra Environmental Resources Center, Chico Paddleheads, Foothill Conservancy, Friends of the River, Friends of the Tule River, Kern River Alliance, Kern Valley Community Consensus Council, Kernville Chamber of Commerce, Mono Lake Committee, Natural Heritage Institute, Planning and Conservation League, San Joaquin Paddlers, Save our Streams, Sequoia Paddling Club, Shasta Paddlers, Sierra Nevada Alliance, South Yuba River Citizens League, Trout Unlimited, and Tuolumne River Preservation Trust.

Commission request further information from PG&E to inform the Commission's evaluation of Application A.22-09-018, given the implications for public safety, responsible long-term operation of the generation assets, protection of California's resources, and future victim compensation issues.

In reviewing a potential transfer of generation assets under California Public Utility Code section 851, the Commission is responsible for protecting the public interest, in part, by ensuring those assets will be operated in a manner that ensures reliability post-transfer. California Public Utility Code section 362, provides in pertinent part,

> The commission shall require that generation facilities located in the state that have been disposed of in proceedings pursuant to Section 851 are operated by the persons or corporations who own or control them in a manner that ensures their availability to maintain the reliability of the electric supply system.

Based on my review of Application A.22-09-018, I understand that PG&E would remain the primary owner of transferred facilities, with a 50.1% stake in Pacific Generation. (*See* Application A.22-09-018, pp. 24-26.) Based on my review of Prepared Testimony filed by PG&E in this proceeding, I have determined that the Company would continue to have primary responsibility for facility operations – a point that PG&E offers as assurance to the Commission and comfort to the general public. (*See* PG&E Prepared Testimony, Amended and Restated Chapter 4 (*hereinafter* Chapter 4 Testimony), p. 4-1.) However, my experience over the past 20 years has led me to believe that PG&E has sought to defer or avoid responsibility for property damage caused by the operation of its hydropower infrastructure, presenting concerns for future victim compensation, and has delayed capital improvement investments, presenting concerns for future public safety and power reliability.

In sum, I have significant concerns regarding the current operation and maintenance of numerous hydroelectric power facilities that PG&E proposes to transfer to Pacific Generation in connection with Application. According to PG&E's testimony, "PG&E will continue to operate and maintain the Generation Assets in substantially the same manner as today, using the same employees, practices, and policies." (Chapter 4 Testimony, p. 4-1.). However, based on its current pattern of behavior, I believe that PG&E's future status quo operation of several facilities presents issues for public safety, victim

compensation, power reliability, and necessary capital improvements. Exacerbating these issues, PG&E has not disclosed dam safety information pertinent to a full evaluation of the merits of its Application. I recommend that the Commission seek further information from PG&E regarding the issues raised below to ensure that any future transfer of hydropower assets complies with the requirements of Section 362.

The purpose of my testimony is to describe these concerns using as examples PG&E's current operation and maintenance of certain hydropower facilities that are proposed for transfer pursuant to California Public Utilities Code section 851. This testimony is based only on publicly available information, given the breadth of information that remains unavailable.

III. PG&E Has Not Disclosed Information Material to the Commission's Consideration of Public Safety in this Proceeding.

PG&E maintains that the proposed transaction will not affect safe and reliable operation of the transferred hydroelectric assets. However, based on my review, Application A.22-09-018 does not actually provide specific information regarding PG&E's current dam safety program or the proposed program under Pacific Generation. FERC noted this deficiency in its comments on PG&E's application seeking permission to transfer the federal licenses for all but two of its hydroelectric projects to Pacific Generation: "despite the above broad statements, you do not provide any specific details about your dam safety program under the proposed new transferee. We need some specific details to ensure that dam safety is not adversely affected." (Letter from Kelly Houff to Kimberly Ognisty and Charles R. Sensiba, FERC eLibrary no. 20230310-3032 (Mar. 10, 2023), p. 3.) One category of information requested was "A list of all significant project safety issues that would adversely affect the immediate safety and/or operational reliability of each project if left unaddressed. Your list should include any existing and ongoing issues that are being investigated, currently being addressed, and/or are planned to be addressed. This list should help ensure that the transferee is aware of all significant dam safety issues at each project being transferred; it will also help the transferee and the Commission evaluate whether the transferee has adequate resources to satisfactorily address the issues." (*Id.*)

In response to this request, PG&E provided a table listing "2022 Combined Dam Safety Surveillance and Monitoring Plans and Reports" it had filed with FERC for individual projects in the

past year. (*See* letter from Charles R. Sensiba to Kimberly D. Bose, FERC eLibrary no. 20230410-5127 (April 10, 2023), pp. 15-16.) I was unable to access the filings listed because PG&E had filed them as non-public, Critical Energy/Electric Infrastructure Information (CEII). Thus, PG&E has not yet publicly disclosed information that describes or even summarizes "all significant dam safety issues at each project being transferred."

CEII is information related to existing or proposed to critical electric infrastructure, generated by or provided to FERC. (18 C.F.R. § 388.113(c)(1).) CEII is supposed to be limited to *specific* engineering, vulnerability, or detailed design information about proposed or existing critical infrastructure (physical or virtual).[3] FERC Order 683, issued on September 21, 2006, sought to address the improper categorization of information as CEII by more specifically defining the types of information that qualify for CEII designation. However, in my experience, many licensees, including PG&E, continue to use the CEII process to withhold essentially all dam safety information, even that information that does not meet the CEII criteria, from public access. This has left the American public, and even other regulatory agencies, in the dark and unknowledgeable about the risks that non-federal dams may pose to their personal safety, families, livelihoods, and property.

My testimony, therefore, omits important dam safety information that PG&E has withheld from public disclosure. Although I was unable to access the information filed by PG&E as CEII, I recommend the Commission obtain this information from PG&E in order to independently complete its due diligence of Application A.22-09-018. As discussed in the following sections, there is good reason to believe there are likely significant dam safety issues affecting the hydroelectric projects proposed for transfer in Application A.22-09-018.

[3] CEII is defined according to the following criteria:
1. Relates details about the production, generation, transmission, or distribution of energy;
2. Could be useful to a person planning an attack on critical infrastructure;
3. Is exempt from mandatory disclosure under the Freedom of Information Act; and
4. Gives strategic information beyond the location of the critical infrastructure. (*Id.*, subdiv. (c)(2).)

IV. McCloud-Pit Hydroelectric Project

The McCloud-Pit Hydroelectric Project (Project No. P-2106) is a large hydropower project with a 368 MW generating capacity, which moves water from the McCloud River near Mount Shasta, California to the Pit River where this water flows through three powerhouses and eventually into Lake Shasta. The head of the project is located at the McCloud Reservoir, which can store up to 35,200 acre-feet (AF) of water. From McCloud Reservoir, water is transferred via a tunnel to Iron Canyon Reservoir. Water from Iron Canyon Reservoir flows, via a tunnel and penstock, to the James B. Black Powerhouse, located on the Pit River. The water from the McCloud River drainage then enters the Pit River and travels through the Pit 6 and Pit 7 developments before entering Lake Shasta.

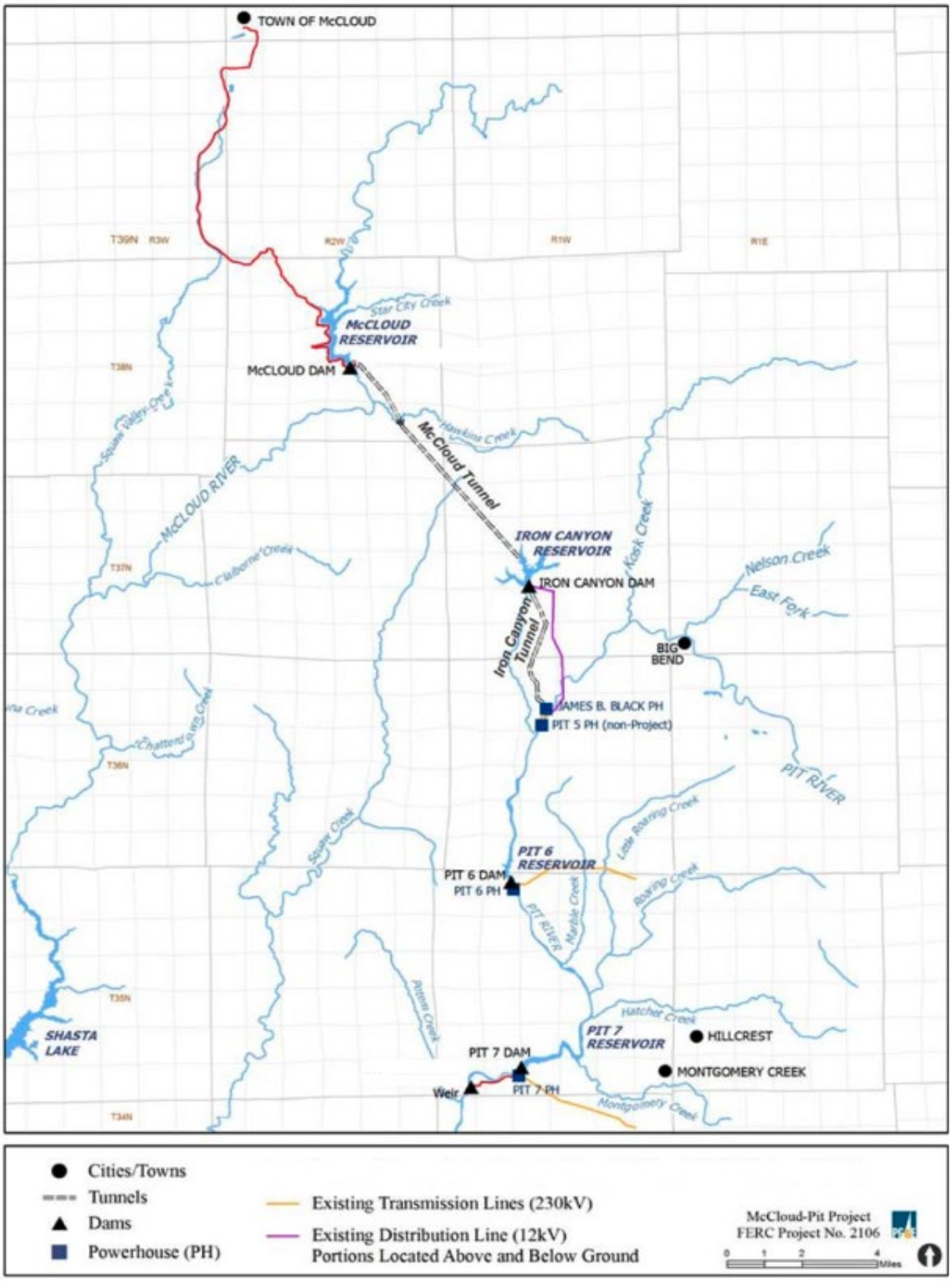

Figure 1: Map of the McCloud-Pit Hydroelectric Project, Project No. P-2106.

My 17 years of experience participating in Project No. P-2106 relicensing has led me to believe that the configuration of McCloud Dam, and more specifically the dam spillway, presents a number of

significant infrastructure issues. CHRC members have participated in the relicensing of the McCloud Project since the process began in 2006. None of the safety issues described herein have been discussed during this seventeen-year process.

Due to PG&E's failure to disclose dam safety information not eligible for CEII designation and ongoing delays, the issues I detail below remain and present, in my view, considerable risk to the public and downstream infrastructure. In my opinion, the serious infrastructure issues posed by Project No. P-2106 warrant a request for additional information from PG&E regarding how the public would be compensated in the event of catastrophic spillway failure to ensure this Commission can make an informed decision regarding the transfer of this generating asset.

In addition, based on my review of PG&E's Testimony in Revised and Restated Chapter 4, I understand that PG&E would continue to oversee the operation and maintenance of this and other hydropower generation projects, even having authority to determine those infrastructure repairs that are covered by its agreements with the newly created Pacific Generation. (Chapter 4 Testimony, pp. 4-6, lines 13-17; Operations and Services Agreement, Chapter 4 Testimony, 4-AtchA-23, §§ 8.1 -8.2.) I understand PG&E's response to CHRC's information requests to mean that, where infrastructure work falls outside the scope of work covered by certain contractual arrangements or PG&E determines the work is unnecessary "to fulfill its obligations under the proposed intercompany agreements," Pacific Generation will have to obtain the proposed services "from a third party at its discretion."[4]

PG&E's response raises two issues. First, rate-payer impacts associated with this nuanced structuring of PG&E's responsibility for and authority over determining whether and how infrastructure issues are resolved remains unclear. (*Ibid.*) Second, further information regarding the scope of necessary capital investments pertinent to maintaining the safety of aging hydropower dams and how such repairs will be financed is lacking, even though such information is critical to the Commission fulfilling its obligations under California Public Utilities Codes section 362.

[4] PG&E Generation Asset Transfer, A.22.09.018 California Hydropower Reform Coalition Data Request No. 1 (Attachment 2), Question and Answer 18; *see also* Question and Answer 20.

Because Project No. P-2106 presents numerous public safety issues, I recommend that the Commission request clarifying and complete information from PG&E regarding the scope of services the Company intends to provide under intercompany agreements to ensure that the party responsible for long-term operations and maintenance, substantive regulatory compliance, and dam safety is held accountable in the event of a spillway failure.

A. PG&E Has Sought Reduced Responsibility for Damage Caused by the McCloud Spillway Alignment

My review of publicly available information regarding Project No. P-2016 indicates that the placement and alignment of the McCloud Dam has the potential to cause erosion, result in spillway failure, and may impact Project No. P-2106's ability to reliably produce power. Exacerbating these concerns, I have been unable to assess all issues posed by Project No. P-2106 because PG&E has asserted that information related to the damage caused by the project, which the Company asserts is located outside the FERC project boundary (and therefore not a PG&E responsibility), is CEII. I find this interpretation of CEII to be at odds with FERC's guidance in Order 683. Moreover, I believe that PG&E's attempt to avoid financial responsibility for damage directly caused by a generating asset, as described below, raises significant concerns for how PG&E would navigate its financial responsibility for any future damage to rate-payer property caused by the faulty spillway.

The McCloud Dam is located just above a significant bend in the McCloud River with the spillway situated on the right abutment of the McCloud Dam. This configuration directs flow onto the opposing hillside rather than down the river channel, causing significant hillside erosion during high flow events. With climate change impacting the frequency and intensity of such events, I believe that Project No. P-2106 poses serious infrastructure issues that could increase in the near term.

Based on my experience participating in the Project No. P-2106 licensing process, I understand that erosion during high flow events typically causes damage to Project No. P-2106 components and the surrounding area. For instance, in 1997, erosion caused by high flows triggered partial collapse of the opposing hillside as well as failure of Hawkins Creek Road, which is adjacent to the McCloud River below the dam. Later, in 2017–another above average precipitation year–spillway release caused

additional erosion and widespread damage to Hawkins Creek Road, resulting in a road closure that lasted six years, eliminating recreational river access to the Pit River and impeding access for wildland firefighters during that time. Exacerbating these access issues, during such events, PG&E did not take responsibility for repairing the damage caused by the faulty McCloud spillway, raising concerns regarding future victim compensation and repair timelines.

Hawkins Creek Road, which was damaged by high spillway flows that enlarged a nearby facility plunge pool and washed away significant portions of the opposing hillside in both 1997 and 2017, lies on public land managed by the U.S. Forest Service. Consequently, PG&E refused to repair the road, insisting that such repairs were the responsibility of the Forest Service. In a letter to FERC, PG&E stated:

> As described in the text of the report; the lower slide appears to be a result of plunge pool enlargement following large storm events and spillway operations, whereas the upper slide appears to be a result of road realignment performed by/for USFS in 1997 following major storm events that year. (Attachment 3)

While PG&E acknowledges in this statement that the lower slide is a result of McCloud Dam spillway operations, the Company attempts to place responsibility for the second failure on the Forest Service. However, as described above, the need for the Forest Service road realignment in 1997 was a direct result of McCloud Dam spillway's erosion of the slope, which triggered plunge pool enlargement. The Forest Service spent substantial staff time seeking PG&E agreement that necessary road repairs were a Company responsibility. PG&E's dispute of repair responsibility required considerable staff time and expense–an expense which is ultimately borne by PG&E's rate payers. Based on my understanding of PG&E's information request responses, this rate-payer expense will only be exacerbated in the future, given the need for PG&E to confer with Pacific Generation during this process to determine liability.[5]

[5] PG&E Generation Asset Transfer, A.22.09.018 California Hydropower Reform Coalition Data Request No. 1 (Attachment 2), Question and Answer 19.

As climate change intensifies storms, high flow events, which could cause a catastrophic spillway failure, pose significant risk to downstream residents and infrastructure. I therefore believe that additional information regarding Pacific Generation's ability to compensate Californians for these anticipated issues is necessary, especially in light of prior issues with PG&E accepting responsibility for repairs.

B. McCloud Dam Design Flaws Have the Potential to Undermine Power Reliability

My review of publicly available information further indicates that the above-described McCloud Dam design flaws are also impacting PG&E's operation of Project No. P-2106. For example, to minimize future plunge pool enlargement and adjacent hill slope failures, PG&E will be operating the McCloud Reservoir at a lower elevation to reduce the need for spillway use. Inability to fill McCloud Reservoir to its full capacity will, in my opinion, impact the generation capability and amount of power Project No. P-2106 supplies to the grid.

To my knowledge, PG&E has not publicly disclosed the full impact of reduced reservoir capacity on power generation. This prevents a full and accurate evaluation of ALJ Scoping Memo Issue 14. I read the Testimony and Application materials provided by PG&E in this Proceeding to provide only information regarding hydropower project generating capacity, rather than actual hydroelectric power production information. (*See* PG&E Prepared Testimony, Chapt. 2, Table 2-1.) The CHRC submitted an information request to PG&E, seeking to clarify the actual power production supplied by PG&E's hydroelectric assets. Based on my review, I do not believe PG&E has provided a direct and full response because the generating capacity for only a handful of projects are addressed therein.[6]

I view information regarding recent hydropower power production as necessary to fully assess the impact of the proposed asset transfer on the rate-paying public, and therefore, recommend that the Commission require PG&E to provide information clarifying the actual power produced by all

[6] PG&E Generation Asset Transfer, A.22.09.018 California Hydropower Reform Coalition Data Request No. 1 (Attachment 2), Question and Answer 14.

hydroelectric projects proposed for transfer. In my opinion, such information will help to clarify this issue and confirm the generating assets will be managed in a manner that ensures power reliability.

C. The McCloud Dam Spillway Design Violates Dam Safety Standards

California has adopted dam safety design criteria to ensure that dams within the State can withstand seismic activity and safely retain and pass flows, in compliance with FERC design standards. (*See* Ca. Water Code §§ 6000 *et seq.*) However, my participation in Project No. P-2106 relicensing suggests that the McCloud Dam spillway does not comply with current dam safety standards, increasing the risk of a potential catastrophic failure that could significantly impact downstream communities.

A key dam safety design criteria is the ability to safely pass the largest reasonably foreseeable flood event for the watershed in which the dam resides. (FERC, Engineering Guidelines for the Evaluation of Hydropower Projects (*hereinafter* Hydropower Project Guidelines), Chapt. 2, pp. 2-6 - 2-8, Chapt. 8.) This flood event is known as the Probable Maximum Flood. In addition, a dam's spillways, or other flood control features, must be designed to carry this flow, which is known as the Inflow Design Flood. (*Id.*, Chapt. 2, pp. 2-1 - 2-6.) If a dam's Inflow Design Flood is less than the watershed's Probable Maximum Flood, the dam runs the risk of being overtopped and failing during a large flood event – which is a significant concern as climate change intensifies California's swing between drought and deluge. (*See ibid*.) My review of Project No. P-2106 FERC docket information suggests that this is an issue for the dams associated with Project No. P-2106.

In a May 2020 letter from FERC to PG&E, FERC opined that several dams associated with the McCloud-Pit Project would likely be overtopped during a Probable Maximum Flood event. According to FERC,

> The revised studies indicate that several of the dams would likely be overtopped during the PMF. However, PG&E's submittal does not discuss any potential dam safety implications that would result from the overtopping at these dams, nor any proposed actions to address this issue. Please evaluate the potential impacts that overtopping would have on these dams, and provide a plan

and schedule to mitigate against any adverse effects that the overtopping could have on dam safety and/or the safety of downstream populations. (Attachment 4)

Unfortunately, I was unable to review the referenced study because it was classified as CEII, without justification, and not publicly accessible. However, in a subsequent June 1, 2020 filing, PG&E disclosed specific and concerning details regarding the McCloud Dam's inability to pass a Probable Maximum Flood event. PG&E indicated that,

> The current [Inflow Design Flood (IDF)] for McCloud Dam, developed in 2012, is 70,000 cubic feet per second (cfs), which is approximately ***50% of the probable maximum flood*** (PMF), based on the results of a 1988 dam failure study. In February 2020, PG&E completed an initial screening-level IDF evaluation, which indicates that a hypothetical failure of McCloud dam at the peak reservoir elevation under PMF conditions would produce a peak discharge of approximately 2.1 million cfs at the dam, which is about 16 times the peak non-failure PMF spillway discharge of approximately 133,000 cfs. (Attachment 5)

Based on my experience, I believe that rebuilding or reconfiguring the spillway to correct this issue will be an expensive endeavor, likely costing hundreds of millions of dollars. Perhaps more concerning is the expected timeline for completing these repairs, which could take a decade or more. During this lengthy period, I believe that the safety problems related to Project No. P-2106 will persist, and power reliability and production will remain at issue.

D. The Pit 7 Afterbay Dam - A McCloud-Pit Hydroelectric Project Component - Poses Serious Public Safety Issues

The McCloud-Pit Project diverts water from the McCloud River to the Pit River via a series of reservoirs, tunnels, and powerhouses. Upon arriving in the Pit River watershed, these flows discharge into Pit Reservoirs 6 and 7. Pit Reservoir 7 is an afterbay reservoir that acts to regulate flow discharging from powerhouse turbines. The reservoir is retained by a 30-foot-high, steel reinforced, rock-fill structure, with a variable width concrete gravity regulations weir section.

Although the purpose of the Pit 7 Afterbay Dam is a safety feature designed to moderate flow fluctuations from the upstream powerhouse, I believe the dam has safety issues of its own, as it has

caused several fatalities. I find these Pit 7 Afterbay Dam safety issues to be exacerbated by the dam's creation of enhanced angling opportunities below the dam. The dam hazard is created as water coming through the dam is focused through a structure known as a v-notched weir, which is designed to slow down flow fluctuations from the upstream powerhouse. Because the weir slows flows by focusing the upstream flow energy, the weir causes extreme hydraulic conditions that have drowned recreators, thereby jeopardizing public safety and creating significant financial liability for the owner. Because the Pit 7 Afterbay Dam acts as a barrier to upstream fish migration, fish tend to concentrate below the dam, creating excellent fishing opportunities and attracting anglers, who can be injured or killed by these conditions.

In 2014, Several CHRC member organizations filed a letter with FERC highlighting the hazards associated with the Pit 7 Afterbay Dam (Attachment 6). In this letter the CHRC highlighted not only the public safety risk posed by this structure, but also several options to reduce these risks. Several meetings have taken place between PG&E, the U.S. Forest Service, and American Whitewater to discuss public access accommodations, while reducing the hazards associated with the Pit 7 Afterbay Dam and the upstream powerhouse. To date, PG&E has not taken any actions to remedy this problem, nor has it implemented the CHRC's recommendations for drowning risk reduction. Now PG&E proposes to pass these problems off to Pacific Generation with little explanation of whether such issues will be resolved, and how the liabilities associated with Project No. P-2106 influence the value of generating assets proposed for transfer and the pool of potential investors. I believe that more information is needed from PG&E to clarify these significant public safety concerns, as well as how this liability impacts the future financial condition of PG&E and Pacific Generation. (*See* ALJ Scoping Memo, Issue 10.)

V. Upper North Fork Feather

The Upper North Fork Feather River Hydroelectric Project (Project No. P-2105) is a 362.3 MW hydroelectric project located on the North Fork Feather River in Plumas County, California. "The North Fork Feather is steep, dropping about 35 feet per mile. This gradient made the river a prime target for hydroelectric development. Several hydropower dams, owned and operated by [PG&E], block and

reroute the river and its tributaries, earning it the nickname 'the Stairway of Power.'"[7] (Figure 2.) Project No. P-2105, situated near the headwaters of the North Fork Feather, consists of three dams and their associated reservoirs, five powerhouses, and other appurtenant structures.

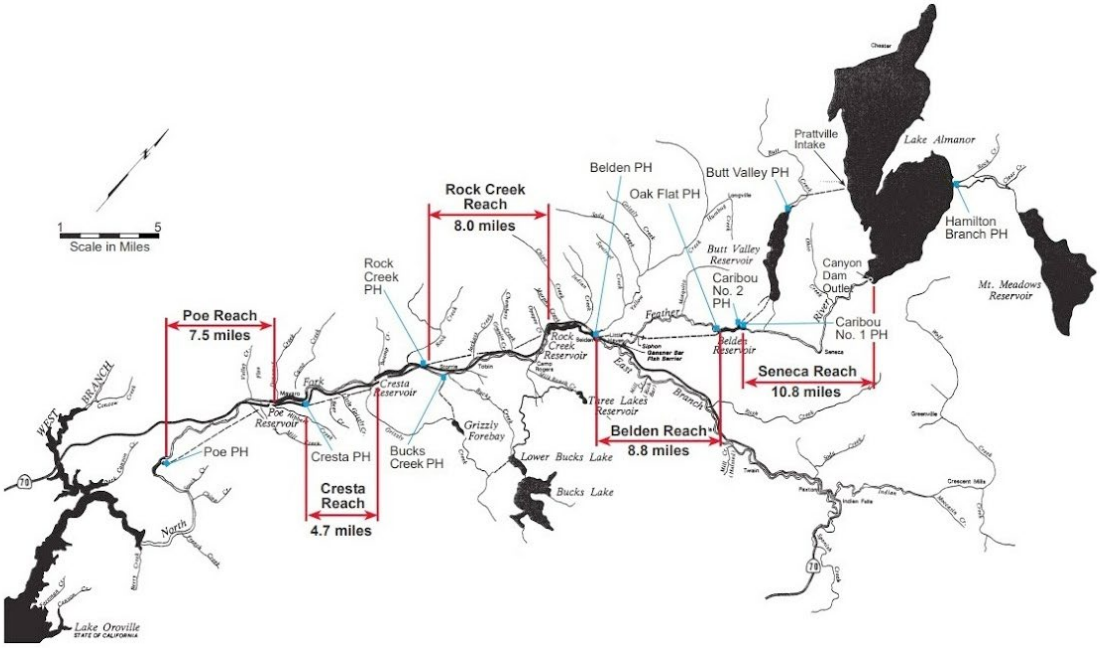

Figure 2: PG&E's "Stairway of Power," comprised of several hydroelectric generating assets proposed for transfer.

Lake Almanor – one of the three Project No. P-2015 reservoirs – is the eighth largest reservoir in California and is impounded by Canyon Dam. Originally constructed in 1914, Canyon Dam was raised to its current elevation in 1962, enlarging Lake Almanor to its present capacity of 1,308,000 AF of water. Since PG&E raised Canyon Dam to its current elevation, numerous flood events occurred in the Feather River watershed, including in 1964, 1983, 1997, and 2017. However, the spillway at Canyon Dam has still never been used or tested.

A. Canyon Dam Presents Unacceptable Inundation Risks to the Town of Chester, California

Initial evaluations that I conducted, and which American Whitewater filed with FERC, described in detail below, indicate that very large flows present a significant inundation risk to the town of

[7] HRC, Rock Creek-Cresta Project, *available at* https://hydroreform.org/resource/rock-creek-cresta-project/ (last visited June 12, 2023).

Chester, California. In my opinion, this potential creates serious concerns for victim compensation, especially considering the approach PG&E took for contesting its responsibility to repair damage to Hawkins Creek Road (*see* discussion in above section IV.A).

Frequently, a reservoir's maximum operating elevation or "gross pool" elevation is defined as the dam's spillway crest, which creates a fail safe for spillway operations (*i.e.*, reservoir management is passive). The gross pool represents the elevation at which a reservoir should no longer store water. Unusually, at Lake Almanor FERC established a gross pool elevation that is six feet *below* Canyon Dam's spillway crest, creating additional operational requirements in which the operators attempt to manually limit the reservoir elevation (*i.e.*, the typical failsafe is absent, and the reservoir operator must manually operate the reservoir in a manner that avoids inundation of the surrounding area). The typical failsafe (*i.e.*, a passive spillway that can pass large flows as a backup, in contrast to smaller releases from the dam's outlet works) is therefore absent, introducing significant flood risk due to the usual design circumstances here. Despite a thorough search of the P-2015 Project FERC docket, I could find no explanation as to why FERC established a gross pool elevation that is below the spillway crest. However, examining topographic map and GIS information suggested a potential rationale for this approach.

My comparison of topographic mapping with the Canyon Dam elevation showed that the dam's spillway crest elevation is roughly the same elevation as portions of Chester, California - a town on the northern shore of Lake Almanor. Thus, I believe FERC likely established a maximum reservoir elevation of six feet below the spillway crest because use of the spillway would result in inundation of portions of Chester. I also believe the purpose of establishing a gross pool below the spillway is to reduce the probability of Chester inundation associated with operational errors or hydrologic circumstances (*e.g.*, high flows).

Because the Canyon Dam spillway cannot be used to release flows from behind the dam, the spillway design flood would cause inundation of large parts of Chester. Runoff events smaller than the spillway design flood quickly begin to flood parts of Chester because dam releases are limited until flows begin to go over the spillway crest. In addition, any circumstances that disable the outlet works at

Canyon Dam can result in use of the spillway crest, resulting in flood risk. Thus, there are several flow and operational scenarios under which PG&E would have liability for the flooding of Chester. This raises concerns for victim compensation.

American Whitewater recently published this analysis, which indicates that the Canyon Dam spillway crest is higher than low-lying parts of Chester and, when factoring in the additional height of water passing over the spillway crest, a significant portion of Chester may be inundated if the spillway is tested or used (Attachment 7). This possibility is not disclosed in publicly accessible portions of the Project No. P-2015 docket.

B. Despite FERC Dam Safety Concerns, PG&E Has Continued to Delay Assessment and Repair of the Canyon Dam Spillway

The FERC Dam Safety Division has expressed concerns with Canyon Dam's design and general condition. On May 2, 2023, PG&E filed an extension of time request to address recommendations from the 11th 5-year Part 12D safety inspection report (dated January 2021) and focused spillway assessment report (dated December 27, 2017) for Canyon Dam (Attachment 8(a)). Enclosure 1 of the PG&E extension request details ten safety recommendations related to addressing deficiencies in Canyon Dam's spillway design and condition. (*Ibid*.)

Recommendations from the Focused Spillway Assessment (Attachment 8(b)) include repair of damaged concrete found in multiple spillway areas. In fact, my review of the assessment confirms multiple spillway issues, including concrete delamination, cracks, failed repairs, voids, exposed wire mesh and reinforcements, and over 4,000 linear feet of joints that need repair and/or sealing (*see ibid.,* recommendations 1, 2, 3, 4, and 9).

Based on my review of the 11th Part 12D Safety Inspection Report (Attachment 8(b)), FERC appears to focus on design issues with the spillway and recommends: (1) performing a hydraulic analysis of the spillway for flows up to the Probable Maximum Flood, (2) performing a geologic reconnaissance of the slope opposite the spillway to evaluate erosion and slope instability associated with spillway operation, and (3) performing structural analyses for the spillway walls including for seismic loading (*see ibid.* recommendations 3, 4, and 48).

I believe that the potential for flooding in Chester is a serious concern, and the fact that the Canyon Dam spillway has never been used is an even greater cause for alarm. The history of dam failures due to dam design flaws and deferred maintenance of the type present at Canyon Dam is well documented. History has shown that the first use of flood control structures can reveal significant design flaws. For example, the first use of spill tunnels at Glen Canyon Dam, the second largest reservoir in the U.S., in 1983, resulted in near catastrophic failure. And, during the first use of Oroville Dam's auxiliary spillway in 2017, the spillway nearly failed while only releasing 3% of its design capacity.

Design flaws and poor maintenance issues at Canyon Dam have already been flagged by FERC. However, based on my experience, the issue of potential flooding of Chester has never been discussed as part of the relicensing proceeding for the Upper North Fork Feather River Project. As a result, potential impacts associated with a flooding event have not been analyzed but remain a serious concern. I believe that Pacific Generation's ability to compensate victims in the event of catastrophic failure must be assessed prior to asset transfer.

C. Spillway Failure at Canyon Dam Would Result in Widespread Flooding

Inundation mapping associated with Canyon Dam demonstrates that spillway failure would be catastrophic for the Feather River Canyon and adjacent towns. However, this evaluation appears incomplete based on State and federal standards. I recommend the Commission require the completion of this evaluation immediately.

As required by California Water Code section 6161, the California Department of Water Resources (DWR), Division of Safety of Dams (DSOD) reviews and approves inundation maps prepared by licensed civil engineers and submitted by dam owners for extremely high, high, and significant hazard dams and their critical appurtenant structures. My assessment of the inundation map and associated dam failure analysis for Canyon Dam, suggests that a spillway failure would be associated with a peak flow of over 800,000 cfs and would set off a 50- to 90-foot flood wave in the Feather River Canyon. The inundation map (Figure 3) shows that Oroville, Gridley, Biggs and other areas would be flooded. Notably, PG&E sought to shield this information from the public as well,

having designated it as CEII. However, DSOD released the map, having determined that the information did not meet the federal CEII definition (Attachment 9).

Figure 3: Inundation Mapping for Canyon Dam Failure

D. Canyon Dam Failure Would Cause Significant Issues at Oroville Dam

An even bigger issue than destroying the Feather River Canyon and flooding several towns in the valley, are the impacts of Canyon Dam failure on Oroville Dam. However, to my knowledge, PG&E has never evaluated a potential failure of Canyon Dam and the resulting flood wave, despite FERC recommended design and engineering guidelines.[8] Instead, the data made available by PG&E only analyzes the smaller upstream dam failure impacts to Oroville Dam. This information gap is particularly

[8] According to FERC's Hydropower Project Guidelines, "In addition, special cases where a dam failure could cause domino-like failure of downstream dams resulting in a cumulative flood wave large enough to cause a threat should be considered." (*Id.*, Chapt. 2, pp. 2-6 - 2-7.)

concerning for public safety, given the age of this infrastructure (Canyon Dam, in its current form, is 60 years old). According to the American Society of Civil Engineers,

> While most dams are built for a 50-year lifespan, the average age of a California dam is 70 years old. As dams age, more thorough inspections and evaluations are needed with corresponding timely remediation…In September 2017, DSOD released a listing of the conditions of dams. More than 30 dams operate with restrictions and may require repairs. However, the timeline for repair and rehabilitation work is lengthy.[9]

More importantly, the available data suggests that any Canyon Dam failure would trigger massive destruction, raising the question of how millions of victims would be compensated.

Dam spillways and associated outlet works are generally designed to pass the largest flood event that is possible in the watershed in which the facility resides (the "Spillway Design Flood"), including flow associated with upstream dam failures (*i.e.*, an upstream failure could result in additional flows). Thus, the Spillway Design Flood - the total amount of water that Oroville Dam's spillways are designed to accommodate - has a peak inflow of 720,000 cfs with a peak outflow of 623,200 cfs. My understanding is that the Oroville spillway is designed with a lower outflow cfs because the reservoir is expected to slow any flood as the reservoir elevation rises and accommodates incoming floodwaters over the course of 72 hours.

The Inflow Design Flood at Oroville Dam is equal to the Probable Maximum Flood estimates at the time the dam was designed. As time has progressed, especially after Probable Maximum Flood models were refined to address the effects of climate change, Probable Maximum Flood estimates have increased and have been on an upward trend for several decades. However, the Oroville Dam Inflow Design Flood has not changed, because the dam spillway has not been modified. In 2022, CHRC member Friends of the River developed a memorandum entitled *Oroville Probable Maximum Floods and Spillway Design Floods*, which collects varying Probable Maximum Flood estimates for Oroville

[9] American Society of Civil Engineers, Report Card for California's Infrastructure 2019, pp. 26 - 27 (May 2019) *available at* https://infrastructurereportcard.org/wp-content/uploads/2021/07/FullReport-CA_051019.pdf (last visited June 14, 2023).

dam developed over the years (Figure 4). The effects of increasing PMF estimates are discussed in this memorandum, and displayed in the below figure.

Study Identifier	Author/date	PMP Basis	Initial reservoir elevation	Inflow/outflow in cfs	Peak reservoir elevation
PMF-58	USACE 1958	HMR 36	900 ft.	718,000/ 624,000	917 ft.
The preceding document includes an analysis of the Standard Project Flood and includes estimates of the PMF and freeboard requirements for Oroville Reservoir. The precipitation depth used to develop the hydrology for the PMF was developed by the Hydrometeorological Section of the U.S. Weather Bureau using HMR 36.					
FR-58	USACE 1958	HMR 36	900 ft.	718,000/ 624,000	917 ft.
The preceding flood routing (FR) report utilizes PMF-58 to develop the flood control operation requirements that were used to assist in the project design. Operation criteria included rules both for the use of regular flood control space and for the operation of spillway gates during extreme flood emergencies. Reservoir release limitations, flood control storage, and emergency spillway release diagrams were also included in this report.					
FR-70	USACE 1970	HMR 36	900 ft.	960,000 (likely inflow, the table is not clear.)	NA
"Feather River Basin, California, Probable Maximum Flood For Lake Oroville", October 1980 is an update and addendum to PMF-58. This update included the development of a HEC-1 model and model calibration to the December 1964 flood. Inputs were generally carried over from PMF-58, except that the PMP was revised to 28.9 inches from 21.1 inches, an additional 4.5 inches to the PMP from snowmelt was calculated, and overtopping flows from Butt Valley Dam (assumed failed) and Bucks Lake Dam were included.					
FR-81	Leps 1981	HMR 36	—	—	—
The preceding flood routing (FR-81) memorandum was developed to address the reasonableness of the use of substantially lower initial Oroville Lake elevation before routing the PMF-80 flood. It was determined that El 855.0 was an acceptable and logical initial reservoir elevation before the occurrence of a PMF, assuming that the flood control discharge rules that are outlined in the FR-70 study are followed. The FR-81 study also provides a table that includes results from a hydrologic analysis for several storm events. The table provides the initial reservoir elevation, peak inflow, maximum reservoir elevation, and resulting peak outflow for each scenario.					
FR-83	DWR 1983	HMR 36	855 ft.	1,167,000/ 798,000	921.41 ft.

The preceding report provides an analysis of a hypothetical dam break at Butt Valley Dam to evaluate the effects of the resulting flood wave upstream and through Oroville Reservoir during a PMF event. The computer program DAMBRK was used to calculate the flood wave discharge, depth, and velocity. The FR-83 report also provides a wind-wave analysis to evaluate overtopping potential due to wave run-up.					
PMF-03	DWR 2003	HMR 59	900 ft.	725,000/ 675,000	917.5
The preceding study (PMF-03) is considered an update and addendum to the PMF-80 report. This report uses HMR 59 to estimate the PMP and the resulting PMF at Lake Oroville. This report also includes the conversion of the basin model from the original HEC-1 model to the newer HEC-HMS model. The change to HMR 59 from HMR 36 resulted in a 17 percent decrease in peak flow through the reservoir. This study also eliminated overtopping failure of the Butt Valley Dam from the PMF inflow and it is unclear whether snowmelt impacts were considered in the results.					
FR-06	DWR 2006	HMR 59	901 ft.	725,000/ 675,00	917.5
The preceding memorandum (FR-06) includes routing of the PMF-03 that was developed in the 2003 study through the spillway at Oroville Reservoir under various conditions. A review of Oroville Dam in 1999 by the Director's Safety Review Board (Sixth Part 12D Board) advised that for the development of an updated PMF, routing should consider full operation of the spillway gates and the effect of non-operation of one and two spillway gates. As a result, this study utilized PMF-03 for each modeling scenario, and only the initial reservoir elevation and spillway discharge curves were adjusted to evaluate the peak discharge and resulting reservoir water surface elevation.					
	DWR 2017	HMR-59 NOAH Atlas 14		743,800/ 716,000	919.2 ft.
The preceding information was gathered from FERC/DWR correspondence from 2018 to 2022 because, apparently, estimates of hypothetical "Noachian" deluges (PMFs) are regarded as Critical Energy Infrastructure Information and are not currently available to the public.					

Figure 4: Table collecting Oroville Dam PMF estimates developed by FERC and DWR, as compiled by Friends of the River.

Based on this information, it is my opinion that Oroville Dam itself would sustain significant damage under Probable Maximum Flood circumstance (*i.e.*, publicly available information indicates the hillside below the auxiliary spillway and the concrete portions of the spillway would sustain significant damage) but would likely survive the event (Attachment 10). This is because, as explained above, the Oroville Dam spillway design Inflow Design Flood is equivalent to the Probable Maximum Flood. Typically, the Probable Maximum Flood incorporates approximately five feet of reservoir freeboard to accommodate extreme conditions associated with wave and wind run up in a Noachian deluge. However, with increasing Probable Maximum Flood estimates (i.e., climate adapted modeling), the reservoir freeboard available is reduced by 40%. *Since upstream dam failures are a component of the*

Probable Maximum Flood estimate, we can see from the Butt Valley Dam failure scenario (FR-83), higher flows, such as those that would be caused by a failure at Canyon Dam, could result in Orville Dam overtopping. Nonetheless, adequate detail to fully evaluate the impact of a Canyon Dam failure on Oroville Dam is notably absent from the information PG&E has made publicly available.

In Butt Valley Dam failure scenario FR-83 (Figure 4) DWR evaluated the possibility of a concurrent dam failure at Butt Valley Dam - the second hydroelectric project in PG&E's "Stairway of Power," located just downstream of Lake Almanor. (*See* Figure 2, above.) Butt Valley Reservoir is a medium size impoundment, containing just under 50,000 AF of water. Even so, in a Butt Valley Dam failure scenario inflows from that hydroelectric project to Lake Oroville top one million cfs and outflows increase to almost 800,000 cfs. In this circumstance, Lake Oroville (the impounded reservoir) elevation reaches 921.41 ft, just seven inches below the crest of the Oroville Dam. Flows of this magnitude would certainly put the entire Oroville hydroelectric facility at risk.

Glaringly absent from the collected data is an analysis of a potential spillway failure at Lake Almanor, which I believe, based on Lake Almanor volume, would result in inflows and a flood wave that far exceed that produced by a Butt Valley Dam failure by well over an order of magnitude. Based on the FR-83 analysis, I believe that in an Oroville facility PMF scenario, where Canyon Dam fails, the flows to Lake Oroville would exceed the capacity of the reservoir, eliminating the necessary freeboard, and potentially causing overtopping of Oroville Dam. Based on my experience, I believe a dam failure associated with the loss of reservoir crest control at Canyon Dam could move Oroville Dam from a flood operation to a dam safety operation that could cause significant damage to project works and lands in addition to causing levee-break flooding downstream.

Prior to any change in ownership, I recommend that the Commission seek clarification of how Pacific Generation would be capitalized to ensure that victims would be appropriately compensated in event this aging infrastructure fails. Like PG&E's transmission lines, components of the Stairway of Power were inherited from Great Western Power Company. In other contexts (i.e., wildfire caused by inherited transmission lines, repairs to which were also significantly delayed in favor of shareholder

divided distribution), this inheritance has spelled catastrophe for California's residents in and around the Feather River Canyon.

Under penalty of perjury, I swear that the foregoing is true and correct to the best of my knowledge. Executed at Chico, California and respectfully submitted this 16th day of June, 2023.

Dave Steindorf,
California Hydropower Specialist
American Whitewater