BEFORE THE UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

People and Nature First Arizona PHS, LLC, Black Mesa Pumped Storage Project North	)	Project No. 15233-000 Project No. 15234-000 Project No. 15235-000
and	)	Tó Nizhóní Áni Diné Citizens Against Ruining our Environment Center for Biological Diversity Motions to Intervene
People and Nature First Arizona PHS, LLC, Black Mesa Pumped Storage Project East	)	
and	)	
People and Nature First Arizona PHS, LLC, Black Mesa Pumped Storage Project South	)	

Tó Nizhóní Áni, Diné Citizens Against Ruining our Environment, Center for Biological Diversity

MOTION TO INTERVENE RE: PROJECT NO. 15233, 15234, 15235

I. INTRODUCTION

On November 1, 2022, the Federal Energy Regulatory Commission (FERC) issued a NOTICE OF PRELIMINARY PERMIT APPLICATION ACCEPTED FOR FILING AND SOLICITING COMMENTS, MOTIONS TO INTERVENE, AND COMPETING APPLICATIONS ("Notice") regarding an application from People and Nature First Arizona PHS, LLC ("PNFA") for a proposed project called the Black Mesa Pumped Storage Project North ("proposed North Project") (P-15233).

In accordance with the Notice and Rule 214 of the Commission's Rules of Practice and Procedure, 18 CFR § 385.214, the Center for Biological Diversity (the "Center"), Diné Citizens Against

Ruining our Environment, and Tó Nizhóní Áni hereby timely move to intervene and become parties in the proceeding for the proposed North Project (P-15233).

On November 1, 2022, the Federal Energy Regulatory Commission (FERC) issued a NOTICE OF PRELIMINARY PERMIT APPLICATION ACCEPTED FOR FILING AND SOLICITING COMMENTS, MOTIONS TO INTERVENE, AND COMPETING APPLICATIONS ("Notice") regarding an application from People and Nature First Arizona PHS, LLC ("PNFA") for a proposed project called the Black Mesa Pumped Storage Project East ("proposed East Project") (P-15234).

In accordance with the Notice and Rule 214 of the Commission's Rules of Practice and Procedure, 18 CFR § 385.214, the Center for Biological Diversity (the "Center"), Diné Citizens Against Ruining our Environment, and Tó Nizhóní Áni hereby timely move to intervene and become parties in the proceeding for the proposed East Project (P-15234).

On November 1, 2022, the Federal Energy Regulatory Commission (FERC) issued a NOTICE OF PRELIMINARY PERMIT APPLICATION ACCEPTED FOR FILING AND SOLICITING COMMENTS, MOTIONS TO INTERVENE, AND COMPETING APPLICATIONS ("Notice") regarding an application from People and Nature First Arizona PHS, LLC ("PNFA") for a proposed project called the Black Mesa Pumped Storage Project South ("proposed South Project") (P-15235).

In accordance with the Notice and Rule 214 of the Commission's Rules of Practice and Procedure, 18 CFR § 385.214, the Center for Biological Diversity (the "Center"), Diné Citizens Against Ruining our Environment, and Tó Nizhóní Áni hereby timely move to intervene and become parties in the proceeding for the proposed South Project (P-15235).

II. COMMUNICATIONS

All correspondence, communications, pleadings and other documents relating to this proceeding should be served upon the following persons:

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III. IDENTIFICATION OF PARTIES

1. Tó Nizhóní Ání

Tó Nizhóní Ání (TNA), "Sacred Water Speaks," is a Diné-led nonprofit organization established in 2001. In 2005 TNA led efforts to end the industrial depletion of the Navajo Aquifer, Black Mesa's only source of potable water, from Peabody Coal Company. TNA's work is rooted in protecting the waters of Black Mesa while bringing power back to Indigenous communities impacted by coal—Tó bee iiná.

2. Diné Citizens Against Ruining our Environment

Diné Citizens Against Ruining Our Environment ("Diné C.A.R.E.") is an all-Navajo non-profit organization comprised of grassroots community members active on Navajo Nation lands in Arizona, New Mexico, Colorado, and Utah. Incorporated on Navajo Nation in 1991, Diné C.A.R.E. advocates for Diné traditional teachings by protecting and providing a voice for all life within and beyond the Four Sacred Mountains. Diné C.A.R.E. promotes regenerative and sustainable uses of natural resources consistent with the Diné philosophy of life. Diné C.A.R.E. empowers local and traditional people to organize and determine their own destinies, in ways that protect the health of their communities, their long-held subsistence practices, and way of life.

3. Center for Biological Diversity

The Center for Biological Diversity is a national, nonprofit conservation organization with more than 1.6 million members and online activists dedicated to the protection of endangered species and wild places. Among the species we work to protect are many that may be affected by the proposed Black Mesa North, East, and South Projects including threatened Mexican spotted owl, the endangered Colorado pikeminnow, razorback sucker, bonytail, the threatened humpback chub, and the endangered Navajo sedge. This includes critical habitat for threatened and endangered fish in the Colorado and San Juan Rivers.

The intervenors support the development of renewable energy and needed energy storage to support that development, which is a critical component of efforts to reduce greenhouse gas emissions and avoid the worst consequences of global warming. Like any project, proposed energy storage projects must be thoughtfully planned to minimize impacts to people and the environment. In this case, the proposed projects are predicated on water volumes that are simply not available. Further, on and around Black Mesa, where the projects are proposed, people and the environment have already suffered decades of impacts from coal exploitation, and the proposed projects, if built, would worsen this harm. While the intervenors strongly support the development of renewable energy production and needed energy storage, we do not support projects, such as the proposed Black Mesa North, East, and South Projects, that are plainly infeasible, incompletely presented, that threaten further harm to the people, land, water, and imperiled species, and that repeat a history of paternalism and exploitation by seeking permits from federal agencies before consulting with and obtaining the consent of impacted communities and tribal governments.

IV. INTERESTS OF PARTIES

The proposed Black Mesa North, East, and South Projects would be situated atop, along, and

below the northeastern escarpment of Black Mesa near Kayenta, Arizona, in an area that has for decades been exploited for coal production. Coal development has displaced people and land uses, destroyed land, caused pollution, and depleted regional aquifers and springs. Black Mesa contains occupied habitat of the threatened Mexican spotted owls. Each of the three Projects describe four potential water sources: The Colorado River, San Juan River, and two aquifer sources at the proposed sites—aquifers that have seen precipitous decline, alongside their connected springs, at the hand of decades of coal exploitation. The Colorado and San Juan Rivers contain occupied critical habitat endangered Colorado pikeminnow, razorback sucker, bonytail, southwestern willow flycatcher, and the threatened humpback chub. The San Juan River contains occupied critical habitat for threatened yellow-billed cuckoo. The Projects' two proposed aquifer sources, which go unnamed in the applications, discharge at seeps, springs and hanging gardens occupied by threatened Navajo sedge. If any of the proposed Projects are constructed and operated, they will further industrialize and destroy terrestrial ecosystems on Black Mesa, further displace people and existing land uses, and further deplete water from the Colorado River, and/or the San Juan River, and/or aquifers, harming springs, imperiled species and people alike.

Tó Nizhóní Áni (TNA), "Sacred Water Speaks," is a Diné-led nonprofit organization established in 2001. In 2005 TNA led efforts to end the industrial depletion of the Navajo Aquifer, Black Mesa's only source of potable water, from Peabody Coal Company. TNA's work is rooted in protecting the waters of Black Mesa while bringing power back to Indigenous communities impacted by coal—Tó bee iiná. The same aquifers that TNA has for decades worked to safeguard from additional industrial coal depletion are now targeted for depletion by the applicants and applications at issue in this motion.

Diné Citizens Against Ruining our Environment, or Diné CARE, is located on the Navajo Nation and is a non-profit organization that works with many Navajo communities affected by energy

and environmental issues. Since the late 1980s, community people have stood up to demand environmental protection and sustainable development practices, bringing systemic changes in tribal politics and making the grassroots voices evident in the realm of energy development. Diné Citizens Against Ruining our Environment has been intimately involved in the conservation of land, water, wildlife, and cultural values of the Navajo Nation, including Black Mesa, for more than two decades.

The Center for Biological Diversity has been intimately involved in the preservation of species and habitats in this area for decades including the endangered Colorado pikeminnow, razorback sucker, bonytail, and southwestern willow flycatcher, and the threatened humpback chub, Mexican spotted owl, yellow-billed cuckoo, and Navajo sedge. The Center has worked to protect species that may be affected by the proposed Projects including, for example, by petitioning to list the southwestern willow flycatcher, Mexican spotted owl, and yellow-billed cuckoo, and through legal action to secure adequate flows for the humpback chub in the Colorado River system. No other entity represents the Center's interests in these proceedings and the Center's participation would be in the public interest.

The Black Mesa North Project Notice describes proposed facilities and components as consisting of:

> (1) a new upper reservoir with a surface area of 3,300 acres and a total storage capacity of 100,000 acre-feet at a normal maximum operating elevation of 7,910 feet average mean sea level (msl); (2) a new lower reservoir west with a surface area of 1,200 acres and a total storage capacity of 39,000 acre-feet at a normal maximum operating elevation of 5,960 feet msl; (3) a new lower reservoir middle with a surface area of 420 acres and a total storage capacity of 15,000 acre-feet at a normal maximum operating elevation of 5,960 feet msl; (4) a new lower reservoir south with a surface area of 1,300 acres and a total storage capacity of 46,000 acre-feet at a normal maximum operating elevation of 5,960 feet msl; (5) a 6,800-foot-long, 23-foot-diameter concrete lined tunnel and 1,800-foot-long with three 18-foot-diameter concrete lined draft tube tunnel penstock connecting the upper and lower reservoir west to the powerhouse; (6) a 9,400-foot-long, 23-foot-diameter concrete lined tunnel and 2,100-foot-long with three 18-foot-diameter concrete lined draft tube tunnel penstock connecting the upper and lower reservoir

middle to the powerhouse; (7) a 6,750-foot-long, 23-foot-diameter concrete lined tunnel and 2,500-foot-long with three 18-foot-diameter concrete lined draft tube tunnel penstock connecting the upper and lower reservoir south to the powerhouse; (8) three 320-foot-long, 60-foot-wide and 100-foot-high new underground powerhouses containing three turbine-generator units each with a total rated capacity of 2,250 megawatts; (9) a new 80-mile-long, 230-kilovolt (kV) transmission line connecting the powerhouses to either Powell Glen Canyon's existing substation or the Navajo Generating Station's substation; and (10) appurtenant facilities. The estimated annual power generation at the Black Mesa Pumped Storage North would be 4,927.5 gigawatt-hours.

Black Mesa North Project Notice at 1.

The Black Mesa East Project Notice describes proposed facilities and components as consisting of:

(1) a new upper reservoir west with a surface area of 2,700 acres and a total storage capacity of 55,000 acre-feet at a normal maximum operating elevation of 7,510 feet average mean sea level (msl); (2) a new upper reservoir east with a surface area of 1,300 acres and a total storage capacity of 45,000 acre-feet at a normal maximum operating elevation of 7,510 feet msl; (3) a new lower reservoir with a surface area of 2,800 acres and a total storage capacity of 100,000 acre-feet at a normal maximum operating elevation of 5,810 feet msl; (4) a 15,500-foot-long, 23-foot-diameter concrete lined tunnel and 2,000-foot-long with three 18-foot-diameter concrete lined draft tube tunnel penstock connecting the upper and lower reservoir west to the powerhouse; (5) a 9,100-foot-long, 23-foot-diameter concrete lined tunnel and 2,400-foot-long with three 18-foot-diameter concrete lined draft tube tunnel penstock connecting the upper and lower reservoir east to the powerhouse; (6) two 320-foot-long, 60-foot-wide and 100-foot-high new underground powerhouses containing three turbine-generator units each with a total rated capacity of 1,500 megawatts; (7) a new 110-mile-long, 230-kilovolt (kV) transmission line connecting the powerhouses to Shiprock's existing substation; and (8) appurtenant facilities. The estimated annual power generation at the Black Mesa Pumped Storage East would be 3,285 gigawatt-hours.

Black Mesa East Project Notice at 1.

The Black Mesa South Project Notice describes proposed facilities and components as consisting of:

(1) a new upper reservoir with a surface area of 8,200 acres and a total storage capacity of 250,000 acre-feet at a normal maximum operating elevation of 7,610 feet average mean sea level (msl); (2) a new lower reservoir with a surface area of 14,500 acres and a total storage capacity of 250,000 acre-feet at a normal maximum operating elevation of

> 5,810 feet msl; (3) a 13,700-foot-long, 23-foot-diameter concrete lined tunnel and 3,800-foot-long with three 18-foot-diameter concrete lined draft tube tunnel penstock connecting the upper and lower reservoir north to the powerhouse; (4) a 15,400-foot-long, 23-foot-diameter concrete lined tunnel and 2,700-foot-long with three 18-foot-diameter concrete lined draft tube tunnel penstock connecting the upper and lower reservoir middle to the powerhouse; (5) a 17,500-foot-long, 23-foot-diameter concrete lined tunnel and 4,700-foot-long with three 18-foot-diameter concrete lined draft tube tunnel penstock connecting the upper and lower reservoir south to the powerhouse; (6) three 320-foot-long, 60-foot-wide and 100-foot-high new underground powerhouses containing three turbine-generator units each with a total rated capacity of 2,250 megawatts; (7) a new 110-mile-long, 230-kilovolt (kV) transmission line connecting the powerhouses to existing San Juan substation; and (8) appurtenant facilities. The estimated annual power generation at the Black Mesa Pumped Storage South would be 4,027.5 gigawatt-hours."

Black Mesa South Project Notice at 1.

As detailed below, the Black Mesa South, East, and North Project Applications lack sufficient information regarding the proposed sites and facilities, water availability, energy use and generation, or environmental justice impacts to sufficiently inform the public or the Commission for purposes of considering a preliminary permit. In many cases, information is lacking, or information that is provided is plainly inaccurate. In other cases, the applications describe project components or requirements that are plainly infeasible. In all cases, the applications entirely lack any discussion of environmental justice context and consequences; in an area already afflicted by decades of coal mining exploitation, this is a fatal oversight. For these and other reasons listed below, the preliminary applications should be denied.

V. STATEMENT OF POSITION

A. The Commission Should Deny PNFA's Preliminary Permit Applications Because the Applications are Incomplete, Misleading, and Plainly Infeasible

The Commission's regulations (18 C.F.R. § 4.81(b)(1) & (d)), require that all preliminary permit applications provide the physical composition, dimensions, general configuration, and, where applicable, age and condition, of any dams, spillways, penstocks, powerhouses, tailraces, or other structures, whether existing or proposed, that would be part of the project and maps of the proposed

project. The applications' descriptions of the proposed Black Mesa North, East, and South Projects and facilities lack sufficient information to the Commission or the public to understand what is actually being proposed. In many cases, as descried below, some of the information is contradictory, patently false, or depicts plans that would be plainly impossible to build and therefore necessarily cannot and will not "be part of the project."

1. The Applications Are Incomplete for Ignoring Environmental Justice; FERC Should Consider Application Completeness in the Context of Executive Order No. 13985

The Commission should deny the applications for incompleteness given failure to discuss the significant environmental justice context and consequences of the proposed projects. None of the applications mentions environmental justice. Communities of Black Mesa are within the 98th or higher percentile of several federal criteria for disadvantaged communities that are marginalized, underserved, and overburdened by pollution.[1] The environmental justice context of the proposed projects are significant, and involves Black Mesa's history of coal mining that caused displacement and relocation of people and land uses, pollution, destruction of land and cultural values, destruction of pre-historic sites and burials, and the depletion of aquifers, wells, and springs. These impacts are ongoing. The environmental justice consequences of the proposed projects are also significant and involve repeating and worsening many of the same harms that have resulted from decades of coal development on Black Mesa.

Intervenors therefore urge FERC to consider the applications' incompleteness and exclusion of significant environmental justice context and consequences in the context of Executive Order No. 13985, *Advancing Racial Equity and Support for Underserved Communities Through the Federal Government.* Executive Order No. 13985 establishes that it is the policy of the federal government to:

[1] The White House Climate and Economic Justice Screening Tool. 2022. Tract No: 04017942400. Available at: https://screeningtool.geoplatform.gov/en/#8.83/36.7548/-110.2924

> [P]ursue a comprehensive approach to advancing equity for all, including people of color and others who have been historically underserved, marginalized, and adversely affected by persistent poverty and inequality. Affirmatively advancing equity, civil rights, racial justice, and equal opportunity is the responsibility of the whole of our Government. Because advancing equity requires a systematic approach to embedding fairness in decision-making processes, executive departments and agencies (agencies) must recognize and work to redress inequities in their policies and programs that serve as barriers to equal opportunity.

Executive Order No. 13985. While FERC "has elected to voluntarily participate in the process"[2] set forth in Executive Order No. 13985, we urge FERC to go beyond its Equity Action Plan by "advancing equity for all, including people of color and others who have been historically underserved, marginalized, and adversely affected by persistent poverty and inequality" and "affirmatively advancing equity, civil rights, racial justice, and equal opportunity" in its evaluation of preliminary permit applications for the Black Mesa North, East, and South Projects. In this context, the applications' failure to even address environmental justice context and consequences or future study thereof should compel the Commission to reject the permit applications for their incompleteness.

2. The Applications are Incomplete Absent Community or Tribal Consultation and Consent

For the same reasons discussed above, the Commission should deny the applications for lack of consultation and consent of impacted communities and Tribes. Decades of coal mining on Black Mesa has harmed people and the environment. This harm continues today. It includes but is not limited to displacement of people and land uses, pollution, destruction of land and cultural values, destruction of pre-historic sites and burials, and the depletion of aquifers, wells, and springs. The coal mining that caused this harm was imposed on Black Mesa communities absent consultation and consent and despite vigorous protest and objection. Here, as explained below, the proposed projects threaten to worsen these

[2] FERC Equity Action Plan. 2022. Available at: https://www.ferc.gov/news-events/news/ferc-issues-equity-action-plan

harms. And, just as with coal mining, applicants today continue that history of paternalism and environmental injustice by seeking federal approvals without out first consulting and obtaining consent of Black Mesa communities whom, just as with coal, their proposed projects would impact.

3. Project Location Descriptions are Inaccurate

Both the Black Mesa South and East applications are inaccurate and refer to the proposed locations as "southwest" of Kayenta; this is false, they are south to southeast.

4. Transmission Corridors and Termination Points are Inaccurate

Both the South and East documents refer to the proposed transmission corridors as running east from the proposed projects to terminate in northwest New Mexico. One says the termination point will be the San Juan substation and the other says the termination point will be the Shiprock substation. However, the attached maps both show the same termination point - at the Shiprock substation. The San Juan substation is two miles farther west than the Shiprock substation and has a different owner. As discussed later in these comments, neither San Juan nor Shiprock substation could handle the multiple 500 kV lines which the proposed projects would require.

5. Reservoir Descriptions are Inaccurate, Incomplete, And Would Be Impossible to Construct

The applications' descriptions of reservoirs are incomplete, inaccurate, and would be impossible to build. Three applications provide proposed area, elevation, and storage volumes for nine different reservoirs (4 North, 3 East, and 2 South), and maps purporting to show their proposed locations. From this data, the proposed average depths of the reservoirs can also be determined, which range from 17 feet (South project, lower reservoir) to 36 feet (East project, lower reservoir), with the upper reservoirs all having average depths of 30-35 feet. However, none of the applications or their attached maps identify the locations, heights, widths, or construction materials that will be required to impound these reservoirs. These omissions are significant because the Applicants appear to be proposing projects that

would require vary large impoundment structures and require substantially more water supplies than they claim.

The applications show the proposed reservoirs as long, thin strips, generally under a mile wide in their narrow dimension, and up to more than a dozen miles long. No topographic maps are provided but comparing application maps to USGS topographic maps shows that the reservoirs would span impossible topographic roughness and elevation gradients. An application containing such impossible-to-exist proposals should be rejected out of hand, not "studied" for up to four years.

North Project Upper Reservoir

The upper reservoir of the North Project would be impossible to construct. The upper reservoir for the North project is shown as extending for over a dozen miles along the north and northeast rim of Black Mesa, from a point above Tsegi on the northwest to a point east of Chilchinbito many miles to the southeast.[3] The Application claims this reservoir will have a surface area of 3300 acres at elevation 7900'[4] (just under 5.2 square miles), which corresponds to average dimensions of approximately 0.4 miles by 13 miles. The reservoir location parallels the north and northeast rim of Black Mesa, never more than 0.2 miles from the mesa rim except in the southeasternmost mile, where it is up to about .5 miles back from the rim.

The application claims the normal surface of the reservoir will be at elevation 7900', with a maximum pool elevation of 7910'. But a review of the topo map shows that the proposed reservoir crosses numerous canyons which are deeply incised into Black Mesa. In at least two places, the west side of the reservoir is mapped as covering canyons whose current elevations are below 7300', and in one case below 7200'. If there were really to be such a reservoir, it would need to be impounded by a

[3] Black Mesa North, Application for Preliminary Permit, October 2021, Attachment B
[4] Application for Preliminary Permit, October 2021, Exhibit 1, p. 2 of 4.

dam with a height of at least 710', more than Glen Canyon (710') Dam. Clearly the applicants do not actually plan to build several of the tallest dams in the country, as would be required to block all the drainages their alleged upper reservoir would cover.

The proposed reservoir site would be cut into five pieces by terrain higher than the maximum pool elevation. The Applicants' map shows, when overlaid over the USGS topo map, that the reservoir would inundate numerous areas with elevations exceeding 7910', in some cases exceeding 8120'. This is of course impossible - if the maximum pool elevation is 7910', then the pool cannot cover ground where the pre-dam elevation is 8120'. The proposed reservoir would therefore actually contain numerous islands rising as much as 210' above the maximum reservoir pool. This means that the area of the reservoir would necessarily be smaller than claimed by the Application and that the Application therefore contains false information. Where those high elevation areas extend across the entire width of the proposed reservoir, as they do in at least four locations, they would chop the upper reservoir into at least five distinct smaller pieces. This means that there would need to be at least five conduits delivering water from the upper reservoir down to powerhouses, not three as proposed in the Application.

For example, in the area of Lolomai Point (the northernmost point of the proposed upper reservoir, where the pipeline to the Lower Reservoir West is supposed to depart), the Black Mesa elevation exceeds 7910' across the entire width of the proposed reservoir. Thus it would be impossible to locate a reservoir on Lolomai Point with a maximum surface elevation of 7910', and the proposed upper reservoir would actually be split here into separate reservoirs. At the point where the tunnel to the Lower Reservoir West is supposed to be located, the elevation is 7940', so no outlet tunnel would be possible at that location. Any actual outlet tunnel would have to be longer than shown in the Application in order to reach a place with an elevation below 7900' so that the tunnel could access water and not dry land.

As at Lolomai Point, the proposed upper reservoir site is again entirely above 7910' at a pair of locations just east and just west of where the pipeline to the Lower Reservoir Middle is supposed to drop down. At each location, the entire width of the proposed upper reservoir is above 8000', meaning it would be high and dry on both sides of the proposed outlet to the Lower Reservoir Middle. Besides splitting the upper reservoir into more pieces, the high land here would again, as at Lolomai Point, require a longer access tunnel.

Finally, at a location west-northwest of the proposed powerhouse above the Lower Reservoir South, there is yet another location where the entire width of the proposed reservoir is above 8000', so that the upper reservoir would be cut into separate pieces.

East Project Upper West Reservoir

The upper west reservoir of the East Project would also be impossible to construct. This reservoir is also shown as long and thin, extending in a curved arc around a large bay[5] west of Chilchinbito. It is mapped as about 7 miles long, with an average width of about 0.6 miles.

The proposed reservoir would require multiple high dams that would be prohibitive to construct. As with the North project, the map ignores the fact that the proposed site would cross numerous west-draining canyons that would have to be dammed, with some of those canyons several hundred feet deep. The proposed reservoir would cover land whose elevation, per the USGS topo, ranges from 7200' to over 7760', despite the Application claiming a maximum pool elevation of 7510.' The proposed reservoir, as mapped, would thus require impoundments more than 560' tall, enough to rank among the dozen tallest in the U.S.[6] Alternatively, if the Application is to be believed that the maximum pool

[5] "Bay" is a term used in the southwest U.S. to refer to an indentation in a mesa where the edge of the mesa is notched inward. The elevation of the land in the "bay" is thus much lower than the elevation of the mesa into which it is incised.
[6] https://en.wikipedia.org/wiki/List_of_tallest_dams_in_the_United_States.

elevation would be only 7510', then the resulting islands in the reservoir would rise 250+ feet above the full pool, and the reservoir area has been substantially overstated. To make matters even worse, the map in the application shows this reservoir extending east of the rim of Black Mesa at one point, out over the tall cliff forming the mesa rim. This is also impossible, albeit probably due to pure mapmaking sloppiness by the Applicants.

The proposed reservoir site would be cut into at least two pieces by terrain higher than the maximum pool elevation. At the northern end of the proposed reservoir, the USGS topo map shows a dirt road running north-south along the middle of the proposed reservoir. Just south of the northern end of this road, the entire width of the proposed reservoir is on land that is above elevation 7680', far above the proposed maximum pool elevation of 7510' for this particular reservoir. Thus the very northern end of the reservoir would be cut off from the rest, and it would be impossible to pump water in or out of it without additional pipelines that are not part of the application.

A little farther south, the upper terminus of the only mapped pipeline from the Upper West reservoir reaches the proposed reservoir boundary at about elevation 7660', which would put it 150' above the maximum pool elevation. This pipeline would need to be extended both north (to reach the otherwise cut off section of the upper reservoir) and south (to reach the larger southern section of the reservoir. As filed, the pipeline is in an impossible location where no water would be present even if there were an upper reservoir with a full pool elevation of 7510'.

East Project Upper East Reservoir

This proposed reservoir would also be impossible to construct. It is small (only 1300 acres) and occupies almost all of a nearly detached segment of Black Mesa which protrudes north from the main mesa, 2-3 miles from Chilchinbito. The Application says it will have a maximum pool elevation of 7510'. The proposed pipeline from this reservoir to its lower reservoir connects at the very north end of

the reservoir.

Comparing the Application to the USGS topo, the existing land at this reservoir site is below 7510' where the proposed pipeline connects, but only for a very short distance. South of that, the land rises above 7510' and remains consistently above that elevation. Thus, the proposed termination of the power conduit would not be feasible.

Well under half of the proposed reservoir site is actually below 7510', and some of that is in three small, detached pieces along the edge of the mesa. The only substantial area below 7510' is in the central and southern part of the proposed site, and would require a lengthy dam to hold water, with two separate dam sections needing to be well over 200 feet tall. Not impossible, just highly improbable. And because the areas below 7510' are small and distant from the proposed power conduit, that pipeline would need to be considerably longer than the Application shows, while the small reservoir area could constrain the project capacity.

South Project Upper Reservoir

The upper reservoir of the South Project would also be impossible to construct. This is the largest proposed upper reservoir, running along the rim of Black Mesa for over 20 miles. Its proposed north end is near Chilchinbito, immediately south of the proposed upper east reservoir for the East project, and its south end is about 5 miles south of Rough Rock on the easternmost escarpment of Black Mesa. The average width is a little over 0.6 miles, with a total area of 12.8 square miles. It would flood Navajo roads 8066 and 8088, thereby doubling the distance between Rough Rock and the Navajo high school in Pinon.

This proposed reservoir would require multiple high dams, some higher than 800’, whose construction would be impossible or prohibitively complex and expensive. The Black Mesa rim is considerably more dissected in this area than further north. In ten different places, the south/west side of

the proposed upper reservoir crosses side canyons at an elevation below 7200'. Elsewhere, the Applicants' map shows the reservoir inundating land at an elevation above 8040'.[7] For the map to be accurate, impoundments upwards of 840' high would be required. [8] Alternatively, if the application is to be believed when it says the maximum pool of the upper reservoir would be no more than 7610', then the area covered by the upper reservoir would be much smaller than shown on the Applicants map, and they would still need ten separate dams each more than 410' high[9] to dam all the canyons cutting into the reservoir site. Applicants can't have it both ways; without multiple very big dams, one cannot impound the claimed 250,000 acre-feet in the upper reservoir.

The proposed reservoir would be cut into at least ten pieces by terrain higher than the maximum pool elevation. As with the other upper reservoirs, the proposed upper reservoir for the Black Mesa South project would be divided into multiple reservoirs by high ground along the rim of Black Mesa. For example, just west of the point where the southernmost pipe leaves the upper reservoir to descend to the lower reservoir,[10] the Applicants' map shows a ridge crossing the entire width of the proposed reservoir at elevations that range from 7960' + up to 8040' +. At its lowest, this ridge would be more than 350' above the proposed maximum pool elevation of 7610' and would thus cut the reservoir into separate pieces. Farther south, the ridges on either side of Navajo Route 8088 are both above 7920' all the way across the proposed reservoir site, meaning it would be cut into more separate pieces, neither of

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[7] Immediately west of the point where the southernmost pipe leaves the upper reservoir to descend to the lower reservoir, the Applicants' map shows a ridge crossing the entire width of the proposed reservoir at elevations that range from 7960+ up to 8040+.

[8] That would be taller than any existing U.S. dam.
https://en.wikipedia.org/wiki/List_of_tallest_dams_in_the_United_States

[9] There are only three dozen dams in the entire country that are 410' high or higher., per https://en.wikipedia.org/wiki/List_of_tallest_dams_in_the_United_States. This single reservoir would add ten more.

[10] That pipeline leaves the proposed reservoir at elevation 7880+, which is also impossible if the full pool elevation is only 7610'.

which would be connected to a pipeline to a lower reservoir. Yet further south, two more ridges cut across the full width of the proposed reservoir without ever falling below 7800' in one case and 7900' in the other.

In the central section of this reservoir there are at least four more places where a ridge higher than the proposed full pool elevation cuts completely across the proposed reservoir and would divide it into smaller pieces. Three of them are east of the proposed middle pipeline down to a powerhouse, and one is just west of that proposed pipeline.

All told, there are at least nine places where the mapped upper reservoir would be completely bisected by a ridge higher than its maximum pool, meaning that the upper reservoir would actually be at least ten separate pieces, each of which would need its own power conduit to deliver water in and out of it. The application shows only three power conduits, so at least seven more would be needed, none identified in the Preliminary Permit.

East Project Lower Reservoir

About 90% of the proposed lower reservoir would be located on terrain whose elevation exceeds the reservoir's proposed surface elevation. The Application claims that the lower reservoir for the Black Mesa East project would cover some 2800 acres at a normal maximum surface elevation of 5810 feet. The project map, however, when overlain on the USGS topo map for the area, shows that the great majority of the claimed lower reservoir would be well above 5810', with the highest part of the reservoir having an elevation of over 6200'. The two discharge pipes into the lower reservoir both "enter" it at points where the elevation is over 6000'. The actual area below 5810' appears to be no more than 10% of the claimed 2800 acres. Thus either (a) the Application grossly overstates the reservoir capacity, and thus the usability of the reservoir for pumped storage purposes, (b) the Application grossly understates the required pipeline lengths to get to the 5800' level required for pumping from the lower reservoir, (c)

the reservoir grossly overstates the actual reservoir head, and thus the maximum generation capacity, if the actual maximum reservoir surface is at 6200'+ rather than 5810', or (d) some combination of (a)-(c).

South Project Lower Reservoir

The South Project's lower reservoir would also be impossible to build. This is the biggest proposed reservoir of the 9 reservoirs in the three projects, with a total proposed surface area of 14,500 acres (just over 22.6 square miles) at 5800' elevation.[11] Like the other reservoirs, it is shown as long and thin, over 20 miles long with an average width of about 1 mile. It contains lengthy stretches where the entire perimeter is below the proposed full pool, meaning that it would need to have a constructed impoundment that would be miles long.[12] It also contains lengthy stretches where the entire width of the proposed reservoir is above the proposed maximum pool elevation, and thus would be dry, dividing the reservoir into smaller sub reservoirs and reducing the storage capacity of the reservoir.[13] Each such sub-reservoir would need to have its own conduit to convey water in and out of it. Elsewhere smaller ridges also cut the proposed reservoir into smaller pieces. [14]

North Project Lower Reservoirs

i. Lower Reservoir West

The Black Mesa North application indicates that this reservoir will lie just north of U.S. Highway 160 for several miles just west of the town of Kayenta, inundating a powerline and pipeline which parallel US160 in that area. The proposed reservoir would impound a portion of Laguna Creek,

[11] Preliminary Permit Application for Black Mesa South Project, Exhibit 1, p. 2 of 4.
[12] For example, the southernmost several miles, on both east and west, is below 5810' elevation and would need a miles-long dam to contain it.
[13] For example, the entire purported reservoir area east and north of Rough Rock, from west of the White Hills to north of Little Ice Cream Cone Hill, is above elevation 5810', peaking at 6120' on the ridge northeast of Bitsihuitsos Butte.
[14] For example, the narrow but sharp ridge northwest of Burro Wash cuts directly across the proposed reservoir at an elevation that ranges from 6080'+ on the northeast to almost 6200' on the southwest

which drains Tsegi Canyon and a large surrounding area of the Shonto Plateau and is prone to flash flooding.[15] At the proposed maximum pool elevation of 5960', the reservoir would flood Laguna Creek for approximately a mile further west than the western reservoir boundary shown in the Application. This is yet another case of the Applicant's apparent inability to read a topo map, which should by itself disqualify them from being granted a Preliminary permit.

As with the other reservoirs proposed in the Applications, the reservoir would be fully bisected by land lying above the 5960' level,[16] cutting it into two separate smaller reservoirs and necessitating an additional pipeline beyond those shown in the Application.

ii. Lower Reservoir Central

This is the smallest proposed reservoir, some 420 acres at a maximum pool elevation of 5960'. Yet it still has the flaws of its larger siblings. Roughly half of the reservoir area shown in the Application map lies above the 5960' contour, include the claimed location of the inlet pipe, and the westernmost portion of the proposed reservoir would be cut off from the rest of it by a ridge of land above the 5960' which crosses the reservoir site from one side to the other.

iii. Lower Reservoir South

The largest of the three proposed lower reservoirs for the Black Mesa North project, this reservoir would run for about 4.5 miles along the base of Black Mesa, south-southeast of the town of Kayenta. Unlike all the other proposed reservoirs, it would not be dissected into sub-reservoirs by ridges crossing it above the proposed 5960' maximum pool level. However, its entire eastern side except for one tiny knoll at its southern end would lie below 5960', as would about two miles of its western side, extending north from Cottonwood Wash. Thus, building this reservoir as shown in the Application

[15] http://npshistory.com/publications/nava/nrr-2007-005.pdf, p. 9.
[16] In this case, approximately 1/4 of the proposed reservoir, at its western end, would be disconnected from the rest of the reservoir by land lying above 6000' for the entire width of the reservoir.

would require about 6.5 miles of impoundments to be constructed. Impoundments on the west side would also need to be protected from intermittent flood flows from Black Mesa. If no west side impoundments were constructed, then the reservoir would flood areas outside of the boundaries shown in the Application.

Initial water volumes to fill the reservoirs may be substantially understated

The reservoir surface areas and volumes presented in the project descriptions in the Applications imply average reservoir depths of under 40 feet for every reservoir. But the overlay of the reservoir maps over USGS topo maps show large areas with depths of many hundreds of feet would occur. To the extent the Applications understate the resulting reservoir volumes, they then understate the volume of water that would be required to initially fill the reservoirs. It is bad enough that the Applications say nothing serious about how the initial water volumes would be obtained (nothing about water rights or water conveyance systems that would be needed). But by also apparently understating the required water volumes, the Applications call further into doubt the viability of the proposed projects.

The Applicants claim that the reservoirs would have a total surface area of 35,720 acres and would all be covered with floating solar cells to reduce evaporative losses. For context, this proposed reservoir area is more than 62% of the current size of Lake Powell, 57,550 acres at elevation 3525'. [17]

Solar generation would electrically dwarf pumped storage energy consumption

If it is true that the Applicants would cover their reservoirs in solar cells, then based on an average generation capacity of 1 Mw per 7.2 acres[18] and assuming 90% of the reservoir area covered in solar cells, then the generation capacity from the solar cells would be 4465 Mw, three-quarters as large

[17] https://www.usbr.gov/uc/water/Lake_Powell_Area_Capacity_Table_Report_FINAL.pdf, pdf p. 19 of 401. 35720 acres/57550 acres = .6213 = 62.1%. The current Lake Powell elevation can be found at http://lakepowell.water-data.com/, and was 3524.86 feet as of 12/28/22.
[18] https://www.nrel.gov/docs/fy13osti/56290.pdf, Table ES-1.

as from the pumped storage plants themselves.[19] The net generation from the solar cells, at 1 gwh per year per 3.1 acres,[20] would be over 10,000 gwh per year.[21] That would far exceed the net consumption from the pumped storage of an estimated 3285 gwh per year.[22] Thus, the proposed projects would more accurately be describe as a 10,000+ gwh/year solar project with an associated pumped storage projects that would consume not quite 1/3 of the solar generation, rather than a pumped storage project with an unquantified solar add-on.

The application, while claiming this solar generation would occur, ignores the land use required for transformers and transmission lines to collect the solar generation, and the new transmission lines required to deliver it. Almost half of the proposed reservoir acreage is on top of Black Mesa, so there would need to be new transmission lines running down the slopes of Black Mesa to reach the basins below.

Without solar generation, evaporation would be a huge ongoing problem

Alternatively, if the claim that the reservoirs will be covered in solar cells is false, then evaporative losses from the proposed reservoirs will be 3.4- 4.5 feet per acre per year,[23] or 120,000-

[19] 35,720 acres x 90% coverage x 1 Mw/7.2 acres = 4465 Mw.
[20] https://www.nrel.gov/docs/fy13osti/56290.pdf, Table ES-1.
[21] 35,720 acres x 90% coverage x 1 gwh/year/3.1 acres = 10,370 gwh/year.
[22] 13,140 gwh of generation per Applications; assuming a pumping efficiency of 80 percent (per my previously published analysis of CAISO operating data for storage projects), pumping energy would be 13,140/.80 = 16,425 gwh, and net energy consumption of the proposed projects would be 16,425 minus 13,140 = 3285 gwh.
[23] See https://www.usbr.gov/uc/envdocs/reports/ArizonaPortionoftheUpperColoradoRiverBasin-ConsumptiveUsesandLossesReports/AZreport2002final.pdf, estimating 4.5' per year of evaporation from stock ponds in northeast Arizona; alternatively, see www.usbr.gov/uc/water/crsp/studies/24Month_10.pdf, showing Lake Powell evaporation over the last year of 203,000 acre-feet, during a year when reservoir surface area averaged very close to 60,000 acres, for an evaporation rate of 3.4 feet/year/acre.

160,000 acre-feet per year.[24] That is a huge amount, and far exceeds the total Arizona allocation of Upper Colorado Basin water, which is 50,000 acre-feet per year.[25] It is more than triple the former water usage of the now-defunct Navajo Power Plant outside Page, Arizona. It is 30-40 times as much as the roughly 4,000 acre-feet per year of water that were used for the former coal slurry pipeline from Black Mesa to Nevada.[26] The Applications say almost nothing about where or how they would obtain this enormous amount of water (*see* discussion of water resources below).

Even with solar generation, evaporative losses will be massive

The upper and lower reservoirs will all be subject to elevation changes as they are filled and emptied by the cycle of pumping and discharging. This will cause their surface areas to vary substantially. It means they cannot be fully covered in solar cells. The estimate above assumed that solar cell coverage would be limited to 90% of reservoir full pool area. The remaining 10% would be exposed to evaporation when the reservoirs are full, but not if they are drawn down until solar cells cover all of the remaining surface area. Assuming the remaining 10% was exposed to the sun half the time, evaporative losses would still be 5 percent of what they would have been without solar cells, or 6,000-8,000 acre-feet per year.[27] That is still a massive amount, up to twice the amount used by the former Black Mesa coal slurry line, which the Applications wave away as a subject to be studied later.

6. Applications are Incomplete and Misleading for Failing to Discuss the Unavailability of Water Resources

None of the proposed projects can operate without water, yet each of the applications omits

[24] 35,720 acres of reservoir x 3.4 feet of evaporation/year = 121,448 acre-feet per year. 35,720 acres of reservoir x 4.5 feet of evaporation/year = 160,740 acre-feet per year
[25] https://crsreports.congress.gov/product/pdf/R/R45546, p. 7, Figure 2 and footnote 32.
[26] https://clui.org/ludb/site/black-mesa-coal-mine-and-pipeline.
[27] Without solar cell coverage, evaporative losses would be 120,000 - 160,000 acre-feet per year. See comment 6.b, above. 120,000 acre-feet/year x 5% = 6,000 acre-feet/year. 160,000 acre-feet/year x 5% = 8,000 acre-feet per year.

discussion of water unavailability. According to the applications, the proposed projects together would require about 450,000 acre-feet of water to fill their proposed reservoirs, and an unknown volume of water to maintain reservoir levels thereafter given loss to evaporation and seepage. For perspective, 450,000 acre-feet is 150% of Southern Nevada's entire 300,000-acre-foot annual allocation of Colorado River water from Lake Mead. The applications discuss four sources of potential water: The Colorado River, the San Juan River, and two unnamed aquifers. As discussed below, decades of coal development have already depleted regional aquifers at Black Mesa while use of already over-allocated Colorado River water is facing sharp cuts owing to climate-driven flow declines. Scores of peer-reviewed studies show that future water availability will further decrease as regional warming and aridification worsen. In short, none of the potential water sources identified in the applications contain water that is available for the projects, let alone at the required volumes. Thus, the applications are predicated on a presumption of water availability that is plainly false. The applications' failure to disclose or even discuss the obvious threshold problem of water unavailability, and their failure to provide any evidence of any water availability, renders them incomplete and misleading.

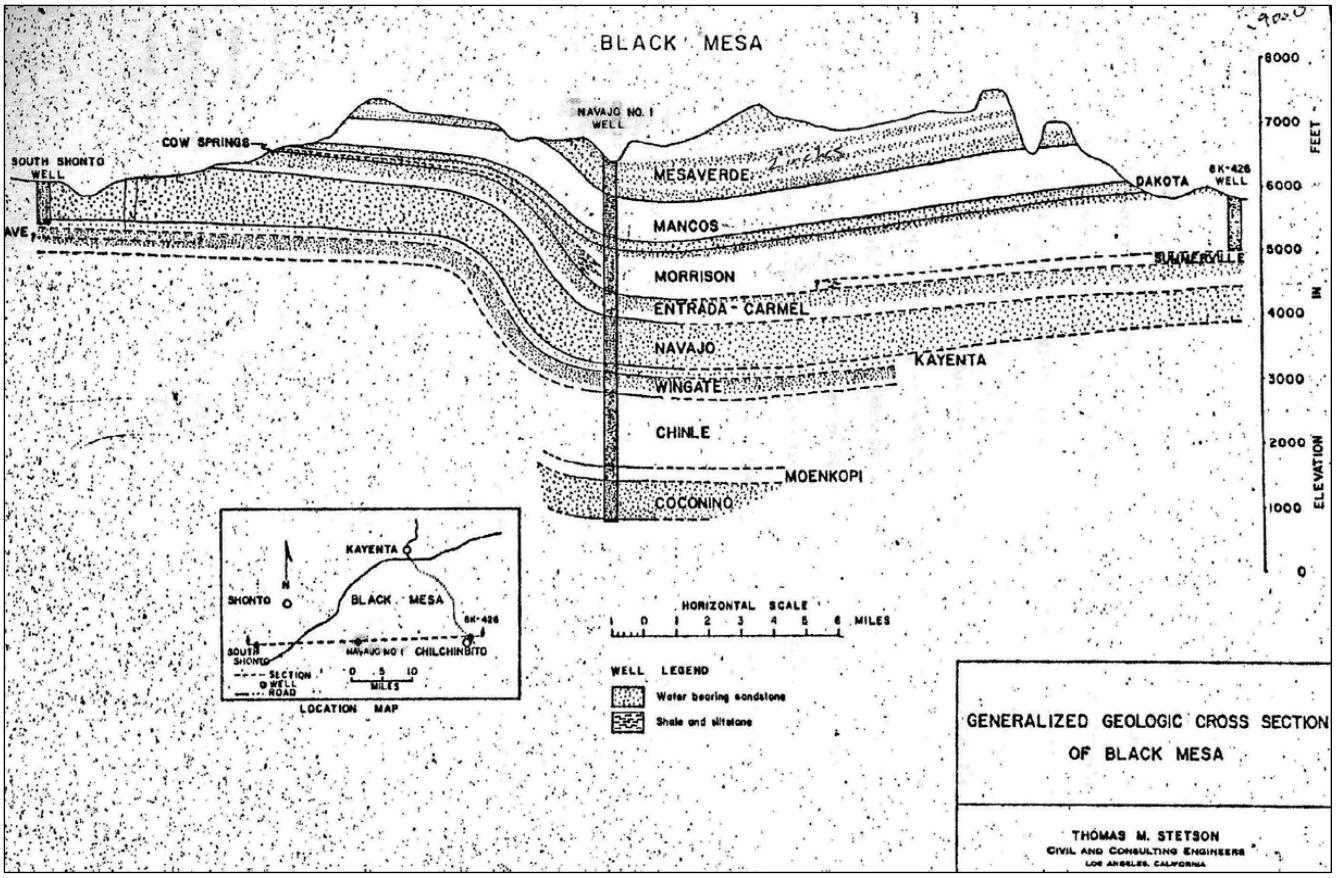
a. Applications are Incomplete and Misleading for Failure to Name or Identify Aquifers

While each of the applications lists "two local aquifers" as potential water sources, each application fails to identify, locate, name, or otherwise describe these aquifers. There are at least three local aquifers, none of which contain water available for the project. The applications' failure to name or identify any aquifer renders the applications incomplete. The applications are predicated on a presumption of water availability that is plainly false.

b. Applications are Incomplete and Misleading for Failure to Identify Available Aquifer Water or Discuss Depletion Effects

While each of the applications lists "two local aquifers" as potential water sources, each

application fails to identify any available water from any local aquifer. There are numerous local aquifers; however, for the following reasons, none of them contain water that could be available for the project.



The Alluvial Aquifer. The aquifers nearest the surface – the unconfined alluvial and Wepo aquifers – have been subjected to fifty years of open pit surface-coal mining activities and were essentially destroyed throughout the mining area which is the same hydrological zone as the proposed storage project.

The Dakota Sandstone Aquifer (D-Aquifer). In the mid-1960s, prior to coal mining activities, Peabody's hydrology consultants determined that industrial pumping from the D-aquifer, just below the alluvial aquifers, would not be feasible because drawdown in the D-Aquifer could cause subsidence,

earth fissures, groundwater degradation, and decrease spring discharge near the Hopi villages and elsewhere on Black Mesa where the aquifer discharges. It is notable, however, that Peabody did in fact withdraw groundwater from the D-Aquifer throughout the mining period. In fact, Peabody and OSMRE's recent *Cumulative Hydrologic Impact Assessment* (OSMRE 2017) acknowledged that an "undetermined" volume of groundwater was pumped from the D-Aquifer for mining activities causing water level decline at the mine area between 200 and 500 feet, and at distant the Hopi villages of 10 and 20 feet.

The Navajo Sandstone Aquifer (N-Aquifer). Below the D-aquifer, the N-Aquifer is the ONLY source of potable water for the Hopi Tribe and for members of the Navajo Nation who reside on Black Mesa. Because 90% of water in the N-Aquifer is between fifteen thousand and ninety thousand years old, it is categorized as "fossil groundwater", replenishable only on geological timescales.

Requiring wells at a depth of at least 3,600 feet, Peabody consultants determined that the mine *could* sustainably withdraw 2,000 gallons per minute from the N-aquifer, equal to approximately 3,200 acre-feet of groundwater per year, and that the mine would never withdraw more than that amount in any single year throughout the life of the mine. Notably, once mining activities were fully operational in 1972, Peabody's withdraws from the N-aquifer averaged approximately 4,400 acre-feet per year. For perspective, where the Black Mesa coal slurry line used about 4,000 acre-feet per year of groundwater,[28] the 450,000+ acre-feet needed to inaugurate the proposed projects would equate to *over a century of slurry line consumption*. Between 1972 and 2005, Peabody was the largest user of groundwater from the N-Aquifer and had a far greater impact than either Peabody or OSMRE acknowledged. Robust, statistically significant evidence has shown strong correlations between the rate of Peabody's groundwater withdrawals and water level decline, declining discharge from springs, and declining water

[28] https://clui.org/ludb/site/black-mesa-coal-mine-and-pipeline.

quality throughout the N-aquifer. Concurrently, there are no correlations between any of these signals and the rate of tribal/municipal groundwater withdrawals or regional precipitation rates.

The Coconino Sandstone Aquifer (C-Aquifer). The deepest aquifer considered for mining operations was the deeper C-Aquifer, beneath the N-aquifer. Peabody consultants determined that it was not economically feasible to withdraw groundwater from the C-Aquifer due the cost of developing wells more than 5,600 feet deep and the energy cost of lifting groundwater from such depths.

The applications' failure to identify any available water from any local aquifer renders the applications incomplete. The applications also fail to identify any legal right of applicants to water. The applications, which require vast amounts of water, are predicated on a presumption of water availability that is plainly false, rending the applications misleading.

c. Applications are Incomplete and Misleading for Failure to Identify Available Colorado River Water

While each of the applications lists "the Colorado River" and "the San Juan River" as potential water sources, each application fails to identify any available water from either river. The applications fail to identify any legal right of applicants to water. The Colorado River and the San Juan River are over allocated, meaning legal rights to water exceed actual river flows. Atop over allocation, regional warming and aridification are driving precipitous flow declines in the Colorado River and San Juan River and, in turn, emergency reductions in water use. As warming and aridification worsens, so too will flow declines. Thus, there is no extra water available from the Colorado River or San Juan River, and declining flows will make that river water more unavailable in the future.[29] The applications' failure to identify any available water from the Colorado River (or San Juan River) renders the applications

[29] *See, e.g.,* Wheeler et al. 2022. "What will it take to stabilize the Colorado River?" Science, 377 (6604), • DOI: 10.1126/science.abo4452 Available online at https://www.science.org/doi/10.1126/science.abo4452

incomplete. The applications are predicated on a presumption of water availability that is patently false.

d. Applications are Incomplete for Failure to Identify or Discuss River Water Transmission

While each of the applications lists "the Colorado River" and "the San Juan River" as potential water sources, each application fails to identify or describe how water would be transported from either river to any of the Projects. Minimum distances from the proposed Projects to either river span more than 40 miles. While none of the projects can be implemented without water, the applications are silent on whether or how water would or could be transported dozens of miles to those projects from rivers. This is a fatal omission to the applications' completeness.

e. Applications' Overall Presumption of an Available Water Supply is False

The applications blithely claim that they will be able to obtain at least 450,000 acre-feet of water to fill the proposed reservoirs (100 Kaf each for the North and East projects, and 250 Kaf for the South project). This assumes that when the lower reservoirs are full, the upper reservoirs would be completely drained. Since the upper reservoirs would all include flooded canyons several hundred feet deeper than their full pool elevations, filling the lower reservoirs would undoubtedly still leave some water in the upper reservoirs. Thus, the total water requirements for the Projects would be well over 450,000 acre-feet. Yet the applications fail to provide any evidence of water availability from the Colorado River, the San Juan River, or regional aquifers. As outlined above, the presumed availability of water from these sources is false, rendering the applications incomplete and misleading. Because the projects cannot operate without water, FERC should deny the permit applications to avoid wasting tax dollars and stakeholder resources on an evaluation of projects that, for lack of water, cannot be implemented.

f. Application Are Incomplete for Failure to Discuss Water Availability in the Context of Regional Warming and Aridification

The Applications are incomplete for failing to discuss the problem of declining water availability

in the context of climate change, regional warming and aridification. As temperatures continue to rise because of fossil fuel development, greenhouse gas pollution, and climate change, regional aridification in the Colorado River Basin will continue to worsen and Colorado River and San Juan River flows will continue to decline. Scores of scientific studies and news articles tell of extant and predicted future flow declines resulting from climate change, regional warming and aridification in the Colorado River Basin. For example, one recent study by Dr. James Overpeck and Brad Udall states:

> Between 2000 and 2014, annual Colorado River flows averaged 19% below the 1906–1999 average, the worst 15-year drought on record. At least one-sixth to one-half (average at one-third) of this loss is due to unprecedented temperatures (0.9°C above the 1906–1999 average), confirming model-based analysis that continued warming will likely further reduce flows…. [R]ecent climate model-based temperature projections indicate that continued business-as-usual warming will drive temperature-induced declines in river flow, conservatively −20% by midcentury and −35% by end-century, with support for losses exceeding −30% at midcentury and −55% at end-century… [P]rojected precipitation increases likely will not suffice to counter fully the robust, thermodynamically induced drying. Increasing risk of severe water shortages is expected.[30]

These findings are affirmed by more massive cuts to Colorado River releases. The Department of the Interior on August 16th, 2022 announced further cuts to Hoover and Glen Canyon Dam releases in 2023—for the second year in a row—owing to "prolonged drought and low runoff conditions accelerated by climate change [that] have led to historically low water levels in Lakes Powell and Mead."[31]

The applications' failure to consider or even mention the water availability in the context global warming, regional warming, and aridification is a fatal omission that is plainly central to of each project's feasibility.

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[30] Udall, B. and J. Overpeck (2017), Twenty-first century Colorado River hot drought and implications for the future, Water Resour. Res.,53, 2404–2418, doi:10.1002/2016WR019638. Available at: https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2016WR019638

[31] https://www.doi.gov/pressreleases/interior-department-announces-actions-protect-colorado-river-system-sets-2023 Press Release "Interior Department Announces Actions to Protect Colorado River System, Sets 2023 Operating Conditions for Lake Powell and Lake Mead"

7. Applications' Characterizations of Electricity Transmission is Incomplete, Misleading, and Inaccurate

The proposed project would need to deliver up to 10,400 Mw to the Western U.S. grid, 6000 from the pumped storage projects described in the applications and another 4400+ Mw from the associated solar generation. [32] Applications claim that all this power would be delivered via the existing 230 kV line between the Glen Canyon, AZ and Shiprock, NM substations. As shown below, this claim is nonsense and lays bare the applicants' incompetence.[33]

a. Shiprock-Glen Canyon Line Can't Accommodate 6,000-10,000 Mw and Can't Be Expanded

The existing line is rated for 400 Mw, constrained by both the line thermal rating (422 MVA) and the existing phase-shifting transformer that is needed to prevent inadvertent flows from higher voltage lines in the region. Assuming flows from the project were sent both east and west, at 400 Mw in each direction, and that there were no prior rights to use the line,[34] that would still mean the maximum generation that could be injected into the line would be 800 Mw. That is nowhere near the proposed 6,000 Mw of pumped storage and the associated 4400+ Mw of solar generation. Given that the existing line has been known to be fully used for over a quarter century,[35] the implication in the Applications that it could deliver the output of the proposed projects is untethered from reality. The existing line was previously studied to see if its transfer capability could be increased by up to 500 Mw. The conclusion

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[33] Alternatively, if the Applicants are fully cognizant that a 230 kV line cannot deliver 6000 Mw of generation, then they are being deceitful. Either way, whether they are incompetent or deceitful, their Applications should be rejected.

[34] Both assumptions are dubious; if they are false then the existing lines would be even more unusable for the proposed Projects.

[35] "The capacity of Western's Shiprock-Kayenta-Glen Canyon 230kV line is now fully committed and Western is unable to provide any new long-term firm transmission service over the line." NTP DEIS, 1996, p. 1-4 (available online at https://www.energy.gov/sites/default/files/EIS-0231-DEIS-1996.pdf, pdf p. 32 of 542).

was that, for a variety of reasons, it could not.[36] If it's capacity cannot be increased by 500 Mw, then it certainly cannot be increased by 6000-10,400 Mw. The right-of-way for the existing 230 kV transmission line is only 125 feet wide. This is not wide enough for a second line in the same right of way. Thus, any new line will also need a new right of way, a fact that the Applications ignore.

b. The Shiprock and Glen Canyon substations cannot handle the proposed 6,000-10,400+ Mw of new generation, so new lines would have to be 500 kV and go to Navajo and Four Corners substations, or else newly built 500 kV substations.

Even if a new transmission route could be established close to the existing Shiprock-Glen Canyon route (which is 183 miles long), it could not terminate at either the Shiprock or Glen Canyon substations. The only size lines that could begin to handle the proposed generation are 500 kV lines. Bundled conductor 500 kV lines can have transfer capacities up to about 2,200 Mw per line. [37] To deliver 6,000 Mw would thus require four lines out of Kayenta, two to the east and two to the west, which could then reliably deliver 6,000 Mw after an N-1 outage (a standard reliability planning criterion). In order to deliver 10,000 Mw with the associated solar generation, another pair of 500 kV lines would be required. The receiving substations would thus need to be able to handle incoming flows of at least 4,000 Mw each. That is probably more than is feasible even at the large Navajo Power Plant 500 kV substation near Page (formerly the source for 2250 Mw of generation) and is probably more than is feasible at the Four Corners 500 kV substation near Shiprock (formerly the source of ~3,000 Mw

[36] https://www.oasis.oati.com/CRCM/CRCMdocs/SHR_NAV_TSR_Study_R4.pdf.

[37] Twenty-two hundred Mw is a generous assumption. WECC Path 22 from northwest New Mexico to Arizona, consisting of the Four Corners-Moenkopi 500 KV line plus two San Juan-Cholla 345 KV lines, has a rated east-to-west total transfer capacity of 1931 Mw in a 2018 study (http://www.oatioasis.com/AZPS/AZPSdocs/FC_TSR_Facilities_Study_-_Final_20180717.pdf, pdf p. 8 of 9) and 2325 Mw in a 2019 presentation (https://www.wecc.org/Reliability/WECC-0141%20Path%20Delisting%20-%20APS%20Presentation%20to%20SWAT%20-%2008-21-2019.pdf, pdf p. 2 of 9). An earlier study for the NTP proposed that it could increase Path 22 capacity from 2415 Mw to 4560 Mw, an increase of 2145 Mw (https://images.edocket.azcc.gov/docketpdf/0000119232.pdf, pdf p. 16 of 33).

of generation). Thus, additional lines would probably be needed further south or west of Navajo and further beyond Four Corners as well. The Applications ignore the need for new 500 kV lines to Four Corners and Navajo (or newly built substations) at a minimum, and probably well beyond, especially if allowances must be made for 4,400+ Mw of solar generation as well. They also ignore the likely need for new substations, to avoid having too much power flowing through a single substation (a security risk as well as a reliability risk).

8. The Commission Should Deny Preliminary Permit Applications Because the Proposed Projects Would Harm Federally Threatened and Endangered Species

Construction and operation of the proposed Projects would destroy or adversely modify occupied and/or designated critical habitat for threatened and endangered species. Section 7(a)(2) of the Endangered Species Act requires Federal agencies, in consultation with and with the assistance of the Secretaries of the Interior and Commerce, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species (16 U.S.C. § 1536(a)(2)). The Act defines critical habitat as the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of the Act, on which are found those physical or biological features (1) essential to the conservation of the species and (2) which may require special management considerations or protection, as well as specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of the Act, upon a determination by the Secretary that such areas are essential for the conservation of the species (16 U.S.C. §1532(5)(A)). Conservation means to use and the use of all methods and procedures that are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to the Act are no longer necessary (16 U.S.C. §1532(3)).

The proposed Black Mesa North, East, and South Projects would be situated atop, along, and below the northeastern escarpment of Black Mesa near Kayenta, Arizona. Black Mesa contains occupied habitat of the threatened Mexican spotted owls. Construction and operation of one or any of the projects would industrialize and destroy habitat for Mexican spotted owls, likely reducing the number and success of breeding pairs, and, in turn, causing further decline of the species.

Each of the three Projects describe four potential water sources: The Colorado River, San Juan River, and two aquifer sources at the proposed sites. The Colorado and San Juan Rivers contain occupied critical habitat endangered Colorado pikeminnow, razorback sucker, bonytail, southwestern willow flycatcher, and the threatened humpback chub. The San Juan River contains occupied critical habitat for threatened yellow-billed cuckoo.

Further depletion of the Colorado River or San Juan River for one or more of the projects would reduce water availability for endangered fish, their designated critical habitats, recovery programs and requisite river flows. Even under current conditions, water managers are unable to consistently meet the U.S. Fish and Wildlife Service's (FWS) recovery flow criteria in the San Juan River. Between 1998 and 2020, the minimum duration criteria of 10,000 cubic foot per second (CFS) flows in the San Juan River Implementation Plan for endangered Colorado pikeminnow and razorback sucker were met in only three years, minimum duration criteria of 8,000 CFS flows were met in only two years, and minimum duration criteria for 5,000 CFS flows were met in only nine years. In each case, the San Juan River Implementation Plan calls for a larger number of years in which these flow thresholds are met than what has been observed. Even under current conditions, water managers are unable to consistently meet FWS's recovery flow criteria in the Colorado River's 15 Mile Reach. This reach is particularly important to the survival and recovery of Colorado pikeminnow and razorback sucker. According to FWS, between 1991 and 2017 peak flow criteria in the 15 Mile Reach were not

met in 14 of 29 years. Only about two in three years saw peak flows exceeding 12,900 CFS. Flows at or above these levels are important to scour fine sediments from backwater habitats, improving their quality for endangered fish. Declining flows, as would result from depletions from the proposed projects, also indirectly harm endangered fish. Lower flows reduce dilution and increase concentrations of heavy metals, selenium, salts, polycyclic aromatic hydrocarbons, pesticides, and other contaminants that harm endangered fish. This year, lower flows have lowered the elevation of Lake Powell sufficient to allow smallmouth bass to pass through Glen Canyon Dam and spawn downstream. Because bass eat chub, this could be catastrophic for the largest remaining population of humpback chub in the Little Colorado River.

The Projects' two proposed aquifer sources discharge at seeps, springs and hanging gardens occupied by threatened Navajo sedge. Further depletion of regional aquifers for construction and operation of the proposed Projects would further deplete and dry seeps, springs, and hanging gardens upon which threatened Navajo sedge depend, resulting in the loss of individual Navajo sedge or entire populations.

Any one of the projects could potentially jeopardize endangered fish in the Colorado River, affect other listed species like yellow-billed cuckoo, southwestern willow flycatcher, Mexican spotted owl, and Navajo sedge, and/or destroy or adversely modify their designated critical habitat. The Commission should not issue a preliminary permit without consultation under the Endangered Species Act, which has not occurred. The Commission should therefore deny the PNFA's preliminary permit applications.

9. The Commission Should Deny PNFA's Preliminary Permit Applications Because the Proposed Projects Would Cause Unmitigable Harm to Cultural Resources

The Commission should deny all three permit applications because each of the projects would

cause irretrievable and unmitigable harm to cultural resources and values on Black Mesa and across the projects' entire footprints, including but not limited to historic and pre-historic habitations and burials, grazing lands, agricultural and hunting areas, religious sites, artifacts, trails, and other values.

B. If the Commissions Inadvisably Accepts the Inadequate and Incomplete Permit Application, the Commission Should Require PNFA To Conduct Additional Studies on the Proposed Projects and Allow Intervenors and Affected Communities to Participate in Study Development

The scope of the proposed studies is inadequate to provide needed information for review under NEPA, ESA, and other laws; for this, additional studies with additional detail are needed. If the preliminary permit is granted, the Intervenors request that they and all other parties and stakeholders be allowed to actively participate in the design and review of all studies.

1. Scope of the Proposed Studies is Incomplete, Vague, and Inadequate

The scope of the proposed studies is incomplete, and descriptions of those studies in the applications are incomplete, vague, and inadequate. The applications often describe studies in sometimes duplicative word salads that lack detail and substance necessary to adequately describe a forthcoming investigation. The applications also fail to connect studies to the specific requirements of Tribal, federal and state law and regulation required for project permitting. The applications list and describe these categories of study:

1) Engineering feasibility – to "substantiate technical feasibility and consummate cost estimates" including "total energy storage capacity, quantity, and capacity of the pump turbine units, operating modes, and any other project characteristics."

2) Geology – to "inform feasibility-level designs" of designs, "mapping will be composed,"

3) Water supply – to "develop a thorough understanding of hydrogeology and… groundwater/surface water relationships" and "variability of Colorado and San Juan River

baseflows" and "other criterial pertinent to groundwater/surface water interaction" and "potential impacts to river flows."

4) Water quality – "impacts… to water quality are not anticipated but will be assessed."

5) Wildlife and Botanical Resources – to "develop survey plans" for "aquatic habitats that might be influenced," and "habitat analysis within the project(s) boundary." And "identification of any species of concern, indicator species, threatened or endangered species, or noxious or invasive weeds," and, "identification of construction and operational particularities… that may impact biological resources."

6) Rare, Threatened, and Endangered Species – "Applicant will consult with appropriate tribal, state, and federal resource agencies during an examination of the area within the project(s) boundary and immediately surrounding areas to assess presence of special status species and potential effects of the project(s) on habitats, individuals, and populations" including "the following steps." These include "reconnaissance surveys to understand existent and extent of habitat for relevant species," "protocol-level surveys," "focused surveys," "identification of existing and potential threats to special status species," "identification of construction and operation… details that may impact biological resources," and, "investigation of relevant papers and reports and review of new information not currently available."

7) Recreation – to consider "potential impacts of project(s)… on present recreation… and protection… measures will be developed where appropriate."

8) Aesthetic Resources – to "administer a visual resource survey and develop potential protection, mitigation and enhancement measures."

9) Cultural Resources – to "participate in a cooperate effort with the THPO to conform with the requirements of Section 106," and conduct a "cultural resource inventory" to understand

"historic and pre-historic cultural resources within the project(s) area and transmission corridors" that "are currently un-surveyed."

10) Socio-economic resources – to examine "economic advantages of the Project to local and regional economies, both due to… construction and operation."

11) Tribal Resources – "Applicant will work with the THPO to conform with the requirements of Section 106 of the National Historic Preservation Act. The Applicant will define an Area of Potential Effects (APE) in coordination with the THPO as details of the Project, especially the final transmission plan and site design, become better defined. Areas requiring additional surveys will be identified by qualified cultural resource professionals, and the results of these surveys will be documented and provided to appropriate stakeholders for review."

12) Wetlands – "Applicant believes that there are no navigable waters or jurisdictional wetlands within the project boundary, however a wetland survey will take place. In the case that wetlands are discovered at these locations during field explorations, the utmost care will be taken to avoid or mitigate impacts due to drilling, test pit excavations, and other activities. Any potential long-term wetland impacts will be addressed with procedures approved by resource agencies."

Black Mesa North, East, South Apps. at PDF 13-16.

These general and vague categories are inadequate to show that the studies will address all relevant issues. For example, the applications lack entirely any discussion or proposed study of environmental justice impacts, yet the projects are proposed in an area with a long history of environmental injustice from coal mining and combustion. That began with siting decisions and legal agreements that excluded and undermined the interests of people who live on and near Black Mesa;

Applicants are now repeating that history by seeking federal approvals without first obtaining consent from those same impacted communities. Environmental justice studies must consider impacts of construction and operation of the proposed projects as additive to and cumulative with the past and ongoing impacts of coal mining operations on Black Mesa; this includes but is not limited to relocations, displacement, land conversion, pollution, aquifer, spring, and stream depletion, financial divestment and exploitation, and other harm to people and the environment that may be worsened by the construction and operation of the proposed projects. Environmental justice studies must also squarely evaluate non-tribal ownership structures that have begotten off-reservation profits; as seen in coal mining operations, similar ownership structures seem to attend of the extant project proposals too.

The "engineering feasibility" studies must include risk of failure for dams and other infrastructure across various time frames. These studies must evaluate the many problems and infeasibilities relating to reservoir siting and construction that are described above, which we will not repeat here. The engineering feasibility studies must also consider how the water chemistry of proposed (and infeasible and unavailable) water sources would interact with and potentially damage dam facilities and shorten the useful life of any components that are in contact with that water. As discussed in comments above, "engineering feasibility" and "water availability" studies must address the rights of way, power, and infrastructure necessary to move water more than 40 miles from the Colorado or San Juan Rivers to Black Mesa on an ongoing basis, on which the applications are astonishingly silent.

The "water supply studies" need to do more than demonstrate that any water is "available" to fill the reservoirs and replenish water lost to evaporation on an ongoing basis: the studies must also consider seepage losses from the upper and lower reservoirs. As discussed earlier in these comments, the water supply studies must explicitly address current and future unavailability of water. This includes but is not limited to overallocation of the San Juan and Colorado Rivers, past depletion of aquifers from coal

mining operations on Black Mesa, and the impacts of regional warming and aridification on future water supply. The water supply studies must evaluate the impacts of further aquifer depletion on flows within regional seeps, springs, creeks, and water wells. The water supply studies must also consider all water rights holders interests (which are subject to ongoing adjudication) as well as instream beneficial uses for fish and other aquatic resources, recreation, and other uses. Water supply studies must additionally address all other relevant impacts and information otherwise discussed in the comments above.

The "wildlife and botanical resources" and "rare, threatened, and endangered species" studies certainly need to address special status and rare, endangered, and threatened species. But the geographic scope of these studies much reach beyond the immediate project areas, as proposed in the applications, to include a geography encompassing of all listed species and critical habitats that may be directly, indirectly, or cumulatively impacted by project construction and operation. For example, pumping water from the Colorado or San Juan Rivers to Black Mesa necessitates evaluating the potential for these additional depletions to directly or indirectly harm endangered fish and their occupied and designated critical habitat. Similarly, the proposal to further deplete Black Mesa's aquifers requires analysis of resultant depletion to connected seeps, springs, and creeks (that may be located dozens of miles away from points of depletion) and associated impacts to special status species, like federally threatened Navajo sedge, that area associated with those habitats. The studies must also evaluate the potential impacts of the projects' aquifer and river depletions on water availability for regional communities, agriculture, and homes.

The applications propose "socio-economic studies" that would only assess socio-economic benefits that would result from the proposed projects. These studies must also evaluate harms, and, beyond enumerating benefits and harms, the studies must quantify the socio-economic impacts likely to result from the projects' construction and operation. The studies must specifically evaluate socio-

economic impacts to people living on and near Black Mesa. How many people will the projects displace? How much grazing land will be destroyed? How will industrialization from building and operating the projects degrade the quality of life for nearby residents? Who will own the project, and will any profits remain on-reservation, or within communities?

The "tribal resources" studies fall short of meaningfully addressing environmental justice context and consequences of the proposed projects that are discussed earlier in these comments.

Each of the studies must include direct, indirect, and growth inducing impacts from increased access roads and other infrastructure that will occur and impact each of the environmental resources in the area.

2. Additional studies are needed, as well as environmental review before studies begin:

a. Location Studies

The Applicant should be required to produce studies based on USGS topo maps showing realistic reservoir locations, maximum pools, actual volumes and surface areas, required pipeline lengths, and resultant powerplant capacities. If these studies are inconsistent with the preliminary permit applications, then the permits should be terminated at that point as having been based on false information. These location studies should include before-and-after topo maps showing the results of any cutting and filling that would be required to remove existing features that would otherwise be above the eventual maximum pools of each reservoir. They should also quantify the volume of land that would need to be moved by cutting and/or filling in order to create the proposed reservoirs.

b. Housing Impacts

Based on the actual location studies, the applicants should identify all residences which would be impacted, either by immersion or by loss/curtailment of road access, and identify the mitigation to be provided. Where mitigation consists of new access roads, the location and environmental impacts of

such new roads needs to be identified and studied. The study of housing impacts should pay particular attention to impacts on the community of Rough Rock, which would be almost entirely surrounded and cut off by the upper and lower reservoirs of the Black Mesa South project.

c. Impacts Relating to Roads

The Applicants should identify all Tribal and county roads (including at a minimum Navajo Nation roads 6485 and 6486; 593; 6520, C503, 806, CR504, C578, C571, C573, C583, and 8081; the Many Farms-Hwy 160 road; and roads 8066 and 8088which its currently-proposed reservoir locations would cover) which would be impacted by the proposed project, and then study what new road construction would be needed to replace those inundated roads. That study should include the proposed locations for replacement roads, the cost of such roads, their impacts on current users in terms of increased mileage required to be driven on the new roads as compared to the existing roads, and the environmental impacts of both new road construction (in terms of disturbed environment, impacts on endangered species, impacts on viewsheds, etc) and impacts of the use of new roads (e.g., increased emissions due to longer driving distances required by new roads routed around the proposed reservoirs). The Applications as written all involve long, thin upper reservoirs that would require multiple impoundments spread across many miles of land. Constructing such impoundments will require road access. The upper reservoir sites currently have only very limited road access, and in the case of the proposed Upper Reservoir East for the Black Mountain East project, no road access at all. The Applicants should thus be required to identify the locations of the new roads that would be required to construct and subsequently access the various project features, including reservoir impoundments, power conduits, transmission lines, and substations. Such studies should include analysis of the environmental impacts of both constructing and maintaining such roads.

d. Transmission Requirements

i. New 500 kV lines and routes

The Applicants should produce detailed studies based on (though not limited to) power flow modeling to identify what new 500 kV transmission facilities would be required to deliver the proposed 6000 Mw of peak project hydrogeneration, plus the thousands of additional Mw of proposed solar generation from the floating solar generation described in the applications. Studies should identify not just the required outlet facilities from the projects themselves, but also the additional downstream facilities (transformers, substations, additional transmission lines) required at and beyond the first point of interconnection to existing transmission lines or substations.

The 500 kV transmission requirements studies should include interconnection studies done pursuant to WECC rules and practices, in cooperation with adjacent utilities (including PNM, APS, USBR, PSCo, TSGT and others as needed), to ensure that downstream impacts on neighboring utilities' portions of the transmission grid are properly identified.

In addition to the power flow and other studies required to identify new 500 kV line requirements, the studies should also identify the routes for such lines. At a minimum, routing studies should include all of the routes studied for the proposed eastern portion of the Navajo Transmission Project (NTP) in the NTP DEIS of 1996, and all of the routes studied for any subsequent proposals for 500 kV transmission across the Navajo nation which passed within 25 miles of the proposed Black Mesa pumped storage sites.

ii. New sub-500 kV lines and routes

It is clear that delivering 6000-10,400 Mw of new generation will require new 500 kV lines to interconnect with the Western U.S. grid. However, it is also likely that if there will be solar generation at each of the upper and lower reservoirs, then lower voltage transmission facilities will be needed to

collect and deliver that generation to the grid. Thus the Applicants should be required to produce further studies identifying the locations and voltages of the required transmission lines and substations to collect generation from the proposed Projects and deliver it to the 500 kV grid. Such studies should specifically address where and how electricity generated from floating solar panels will be collected, aggregated, transformed to higher voltages, and ultimately interconnected to 500 kV facilities. Routing studies for these lower-voltage facilities should include alternatives which avoid the visual and land-use impacts of transmission lines descending the steep eastern escarpment of Black Mesa.

e. Transmission impacts

For each of the new transmission facilities identified in the transmission requirements studies, the Applicants should study the environmental impacts of such studies to the level of detail required for a NEPA-compliant EIS. Although out of date in some ways, the existing EIS for the once-proposed Navajo Transmission Project provides an example of an already-done EIS with accompanying studies for transmission routed through the same area as the proposed projects. Note that the NTP FEIS specifically identified the Marsh Pass area (where the Black Mesa North project would be located) as an area with "Navajo and Hopi traditional cultural places, Class A Scenery, residential views, archaeological resources. raptor habitat, and soil erosion" where "impacts on traditional cultural places would be high" and "visual impacts would remain high." (NTP FEIS, pdf p. 33 of 266). However, the NTP was expected to increase transmission capacity across the Navajo Nation by less than 2200 Mw, while the proposed projects would need to deliver some 6000-10,400 Mw, depending on the level of solar generation associated with them.

f. Laguna Creek impacts

Laguna Creek is a perennial stream with a large catchment area on the Shonto Plateau, and would be inundated by the Black Mountain North project's Lower Reservoir West. The Applicants

should be required to study the impacts of damming Laguna Creek. Such studies should include analyses of how, and how far, impacts would occur upstream of the proposed reservoir due to flooding and sediment deposition, how the reservoir itself would deal with possible sedimentation from storm-transported sediment flows from Laguna Creek, how overtopping of the reservoir from flash flooding would be avoided, and how both normal and flood flows in Laguna Creek would be passed through the Reservoir to continue downstream.

g. Additional Water Studies

i. Initial filling

The Applicants should be additionally required to quantify what the actual initial water requirements for the Projects would be, taking into account that it will not be possible to fully empty the upper reservoirs even when the lower reservoirs are full.

ii. Annual replacement of losses due to seepage and evaporation

The Applicants should be required to study what the evaporative losses would be with or without the proposed solar cell coverage of portions of the reservoirs, as well as losses due to seepage into the underlying formations.

h. Water supply sources and impacts

The Applicants studies should identify how the water requirements quantified in their water requirements studies will be met, both initially and on an ongoing basis. These water supply studies should include the water sources and the routes and mechanisms that will be used to deliver water from the sources to the multiple proposed reservoirs. They should identify not only the environmental impacts of the proposed water delivery mechanisms, but also the legal structures that will enable the proposed water deliveries. Legal analysis should specifically address permitting from the Navajo Nation, and how delivered water will fit into the Upper Basin/Lower Basin paradigm of current water law, given that the

upper reservoirs would be in the Lower Basin and the lower reservoirs in the Upper Basin.

i. Replacement energy source(s)

Pumped storage projects are net consumers of electricity, because the energy required to pump water uphill is greater than that generated when it is released downhill.[38] The proposed Projects as described in the Preliminary Permit Applications (without the proposed massive solar panels) would have a net energy consumption of approximately 3800 gwh per year.[39] The Applicants need to provide studies showing the expected sources of this electricity if the solar panels are not built, based on the expected hours during which pumping would occur and the marginal resources of the Western U.S. grid during those hours.

Alternatively, if the Applicants claim they would self-supply the pumping energy from the floating solar cells that are referenced in the Applications, they would need to explain how they would supply pumping energy during night time hours when the solar cells would not be generating, or provide studies showing how the marginal generation displaced by solar generation would compare to the marginal generation used during pumped storage pumping hours.

j. Dispatch Impacts Study

Relatedly, a dispatch impacts study would analyze the likely marginal sources of generation that would be used to provide pumping energy for the proposed Projects in the absence of some or all of the Projects' proposed solar generation, and the likely marginal sources of generation that would be displaced when the project was generating electricity.

The purpose of this study is to quantify the extent to which the proposed Projects would increase or decrease emissions of greenhouse gases and other pollutants. While a potential environmental benefit

[38] If it were otherwise, pumped storage would constitute a perpetual motion machine and violate the laws of thermodynamics.
[39] *See* discussion above.

of the proposed Projects could be displacement of emissions from natural gas-fired generation that is the primary marginal source of generation for the Western U.S. grid during high-load hours, this potential benefit could be offset by the environmental cost of the projects including both construction impacts and emissions from the generation used to supply pumping energy. There would certainly be emissions increases in some locations, even if there are decreases in others. The net effect of these partially offsetting impacts is likely to be an increase in emissions, which needs to be studied and quantified for NEPA compliance.

Even if some of the marginal sources of pumping energy are the similar in terms of emissions, the fact that more than one kwh of pumping energy is required for each kwh of project generation means that the emissions associated with pumping energy would be greater than any saved emissions from project generation. If the marginal sources of pumping energy include off-peak coal generation, but the marginal generation displaced by project generation is on-peak natural gas generation, then the net emissions could be strongly negative in quantity. In addition, it is likely that the sources of pumping energy and the generation displaced by project generation would be in geographically distinct locations, further increasing local project environmental impacts in the areas supplying the pumping energy.

The goal of the dispatch impacts study would be to quantify the amount and location of emissions changes due to operation of the proposed projects, so that the Commission's NEPA analysis can properly account for the emissions impacts of the projects.

This study should use a Western Electricity Coordinating Council ("WECC")-wide hourly annual dispatch model, run with and without the proposed Projects included (individually and together), to identify changes in the location and quantity of annual generation attributable to the projects. The output of that model, showing generation changes in Mwh terms, would then be coupled to known power plant-specific emissions factors (from EPA data) to calculate the emissions changes for CO2,

NOx, SO2, and particulates attributable to the proposed Project.

There is ample precedent for the kind of study proposed here. The Bonneville Power Authority ("BPA") modelled emission changes throughout the WECC as part of its NEPA analysis of changed electricity marketing as long ago as 1988.[40] NRDC modelled emission changes throughout the WECC as part of its analysis of potential closure of large hydroelectric generators on the BPA system.[41] More recently, Energy + Environmental Economics ("E3") analyzed CO2 emissions impacts of integrating the PacifiCorp and CAISO systems, albeit without using dispatch modeling,[42] and the CAISO used dispatch modeling of the Western U.S. grid to analyze regional impacts include emissions from grid regionalization.[43] More generally, dispatch modeling of the WECC to quantify the locations and amounts of generation changes due to changes in the grid has been done extensively by both electric utilities and developers, as well as their regulators.

Such a study would benefit the public by determining the location and magnitude of the emissions impacts of the proposed Projects and documenting its net greenhouse gas and other emissions.

k. Study of Growth Induced by Tunnel Access, Transmission, and other Facilities

A study of the growth that could be induced by the new access resulting from construction and operation of the project must also be undertaken. It is likely that new and/or improved roads and parking areas would be required for the projects. Will this beget additional recreational visitation and

[40] *See* BPA, 4/88, Intertie Development and Use FEIS, DOE/EIS-0125-F
[41] NRDC, Going With the Flow: Replacing Energy from Four Snake River Dams, April 2000, by David Marcus and Karen Garrison. (Executive Summary available at http://www.bluefish.org/goingwth.htm)
[42] E3, October 2015, Regional Coordination in the West: Benefits of PacifiCorp and California ISO Integration, Technical Appendix, pp. 39-42
[43] *See* http://www.caiso.com/Documents/Presentation-SB350RatepayerImpactsAnalysis-BrattleGroup.pdf#search=SB350, pp. 9-10. Note particularly the last bullet item on p. 9: "Simulations will also yield emissions (GHG, NOx, SOx) for environmental analysis."

tourism? If so, the environmental impacts of that growth in tourism would need to be addressed in any NEPA review and must be studied; this would include a suite of impacts to aquatic and riparian resources, water and air quality, cultural resources, recreation, visual and other resources. Similarly, new roads and transmission could induce growth in a large area that would affect many environmental resources in the uplands as well as air and water quality. All of these impacts must be studied.

l. Economic Viability Study

An economic viability study is needed to address whether and why any additional pump storage would be prudent or needed when existing pump storage projects are not currently fully utilized. For example, there are two pumped storage hydroelectric projects larger than 1000 Mw, each operating in California, that are in relatively close proximity to the high-demand/load centers and renewable generation. These are PG&E's Helms Project in Fresno County in the Sierra Nevada and the Castaic power plant in northern Los Angeles County operated by the Los Angeles Department of Water and Power ("LADWP") in cooperation with the California Dept. of Water Resources.

The Helms Project was specifically built as a pumped storage project and includes the 123,000 acre-foot Courtright Reservoir and the 129,000 acre-foot Wishon Reservoir, with an installed capacity of 1,212 MW.[44] With a nominal installed capacity of more than 1,500 MW, the Castaic project uses the State Water Project's Pyramid Reservoir and Castaic Reservoir to generate hydroelectricity via pumped storage, but the primary purpose of the reservoirs is to store water from the State Water Project for export to southern California cities.[45]

Both the Helms and Castaic projects were designed primarily to generate electricity during periods of high demand (summer afternoons in particular) and to pump water back into the upper

[44] https://en.wikipedia.org/wiki/Helms_Pumped_Storage_Plant
[45] https://en.wikipedia.org/wiki/Castaic_Power_Plant

reservoirs at night when electricity demand and costs were low. During California's energy crisis of 2000-2001, the Helms project was unable to operate because of the round-the-clock demand and high electricity costs caused by the crisis.[46]

The cost of construction of the Helms project ballooned from an initial estimate of $200 million to $600 million.[47] More recently, the increase in electric demand in Central California has consumed transmission capacity prompting PG&E to plan to construct a new 150 mile-long 500 kV transmission line to restore the flexibility of Helms operations.[48]

The CAISO has repeatedly studied the economics of adding new pumped storage capacity to serve California loads, and has repeatedly found negative economic impacts. For example, a 2017 update to earlier studies found that a 1,400 Mw pumped storage project would have revenue requirements well in excess of its benefits under numerous different planning assumptions.[49]

To avoid waste of economic resources, the applicants need to do an economic study analogous to that done for the CAISO, but with costs and benefits specific to the proposed Projects individually and together.

m. Geotechnical Studies May Have Impacts that Adversely Affect the Environment

The Applications state: "The locations of major project features, including the upper and lower

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[46] https://www.latimes.com/archives/la-xpm-2001-jan-24-mn-16302-story.html
[47] http://large.stanford.edu/courses/2014/ph240/galvan-lopez2/
[48] https://www.nwcouncil.org/sites/default/files/ManhoYeung_1.pdf
[49] CAISO, Economic Planning-Production cost model development, 2017-2018, pages 51-116 (available at http://www.caiso.com/Documents/Day2_ISO-Presentation_2017-2018TransmissionPlanningProcess_PreliminaryReliabilityResults.pdf#search=pumped%20storage, pdf) . Those pages consist of a 66 page presentation entitled: Bulk Energy Storage Resource Case Study-Update to the 2016-2017 Transmission Plan Studies, *Shucheng Liu, Principal, Market Development, 2017-2018 Transmission Planning Process Stakeholder Meeting, September 21, 2017* . The charts on pp. 23, 38, 47, 56, and 65 each show, for different planning assumptions, that the revenue requirements for a new pumped storage plant (in green) would exceed the revenues and values that such a plant could produce.

reservoir locations, powerhouse locations, and penstock routes will be investigated by borehole drilling, test pits, sampling, and field and laboratory testing. None of these investigations will take place in wetlands or navigable streams. The drilling will take place only within the identified Project boundary, utilizing permitting. The exact locations and timing of the investigations has yet to be determined." Black Mesa North, East, South Apps. at 5. More information is needed regarding the size of the boreholes and test pits, the equipment needed to undertake these studies. The environmental impacts of the geotechnical studies themselves may be significant and require NEPA and ESA analysis and compliance before they are undertaken.

VI. MOTION TO INTERVENE

As detailed above, Tó Nizhóní Ání, Diné Citizens Against Ruining our Environment and the Center for Biological Diversity (the "intervenors") have unique interests in the land, water, endangered and imperiled species, habitats, and other resources that may be impacted by the proposed Black Mesa North Project, the proposed Black Mesa East Project, and the proposed Black Mesa South Project. The intervenors have interests in supporting renewable energy production and storage projects that provide a net reduction in greenhouse gas emissions while avoiding and minimizing direct, indirect, and cumulative impacts to the environment. For these reason, the intervenors' interests cannot be represented by any other party in these matters. The invervenors' involvement in these proceedings would promote the public interest and would assure protection of the affected habitats, endangered and imperiled species, waters, and other resources. Accordingly, the intervenors respectfully move to intervene in these three proceedings in the public interest pursuant to 18 C.F.R. § 385.214(b)(2)(iii).

VI. CONCLUSION

WHEREFORE, Tó Nizhóní Ání, Diné Citizens Against Ruining our Environment and the Center for Biological Diversity request that the Commission grant the Motions to Intervene in the proceedings

for the proposed Black Mesa North Project, the proposed Black Mesa East Project, and the proposed Black Mesa South Project.

Respectfully submitted,

Dated: December 30th 2022.

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CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing upon each person designated on the official service list in the proceedings as compiled by the Secretary of the Federal Energy Regulatory Commission.

Dated at Oakland, California this 30th day of December, 2022.

/s/ Lisa T. Belenky
Lisa T. Belenky