

**BEFORE THE PUBLIC UTILITIES COMMISSION OF THE
STATE OF CALIFORNIA**

In the Matter of the Application of SOUTHERN)
CALIFORNIA EDISON COMPANY (U 338-E))
Regarding the Future Disposition of the Mohave)
Generating Station.)
)
)
)

A.02-05-046

WATER & ENERGY CONSULTING, HOPI, AND DINE' TESTIMONY

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I. INTRODUCTION

In this proceeding, the California Public Utilities Commission is wandering into an arena of ancient animosities, a land of unparalleled beauty, and an area of unimagined poverty. The Commission ruling in this proceeding will directly affect life on Black Mesa, an area inhabited since at least 7,000 BC and the first site where domesticated corn was cultivated in North America (dating back to 1,900 BC)¹. WEC provides this introduction as an extremely brief synopsis of the land and peoples in question, so the Commission can gain an historic and cultural perspective in its decision-making process. A more complete version of the development of this area, particularly with regard to energy development, can be found in Charles Wilkinson's book Fire on the Plateau².

The Commission's decision in this proceeding could devastate the local people in one of two ways. Continued reliance upon ground water for coal transport will deprive the local people of water that they have relied upon for thousands of years and that is a focal point of their culture and religion, effectively destroying the oldest continuous civilization in the United States. On the other hand, a Commission decision that results in the Black Mesa Mine closing will have catastrophic economic consequences for both the Hopi and Navajo Tribes, depriving them of the majority of their tribal income, eliminating many of the very few good paying jobs on the reservations, and resulting in massive closing of tribally-supported services such as schools, health clinics, and other fundamental governmental operations.

¹ Powell, S. and Gumerman, G. J. 1987. People of the Mesa: Archaeology of Black Mesa, Arizona. Southern Illinois University Press, Carbondale and Edwardsville, IL.

² Wilkinson, C. 1999. Fire on the Plateau: Conflict and Endurance in the American Southwest. Island Press/Shearwater Books, Washington, D.C.

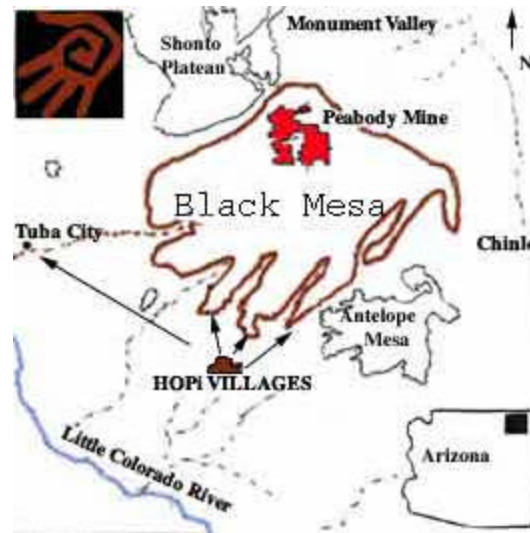


Figure 1.1. Black Mesa Near Rough Rock, Arizona³.

Black Mesa is one of the predominant features of the Colorado Plateau, a vast region extending over several western states. The mesa is a broad, 3,300-square-mile, hand-shaped land formation across the "wrist" of which runs a pine-covered rim at about 8,000 feet elevation. The mesa slopes from 8,000 feet above sea level at its northern boundary, near the Navajo town of Kayenta, gradually southwestward to an altitude of 6,000 feet, where it splits into fingerlike promontories. Along its "fingers," extending to the southwest, lie the Hopi villages, where the Hopi people have lived for over a millennium.

³ http://www.lapahie.com/Dine_Photos.cfm.

Figure 1.2. Black Mesa. Courtesy of Black Mesa Trust



Black Mesa is bordered on the northwest by a vast outcropping of Navajo sandstone that disappears beneath the 1,500-foot-high northern face of the mesa, reappearing in scattered locations fifty or more miles to the southwest, near the Hopi villages. This Navajo sandstone is the source of the N-aquifer, a vast underground reservoir of ancient potable water in the desert. Springs fed by seepage in the porous sandstone have until recently given the Hopi villages a permanent supply of drinking water in this desert. The availability of water on Black Mesa is one of the central reasons that the Hopi settled in this place. The Hopis' existence here is totally dependent on Black Mesa's permanent water supply, and water has a prominent place in their religion.

The Hopi Sinom⁴ (People) live in twelve villages spread among three "finger" mesas at the southern edge of Black Mesa. Atop First Mesa are the three traditional villages of Tewa, Sichomovi, and Walpi. Walpi is the oldest village at First Mesa and was established in 1690 when a village at the foot of the mesa, Koechaptevela, was abandoned for fear of Spanish reprisals after the 1680 Pueblo Revolt. Terraced onto a narrow rock table, Walpi is maintained in traditional form, with cliff-edge houses and no electricity or running water. Figure 1.3 shows

⁴ Translated into English means "Peaceful People". Hopi is an abbreviated version. Hopi and Hopi Sinom will be used interchangeably in this testimony.

Walpi as it exists today⁵. Next to Walpi is the village of Sichomovi, founded in the mid 1700s when Walpi became too crowded. Shortly after the Pueblo Revolt of 1680, Rio Grande Tanoan-speaking pueblo people from New Mexico established the village of Hanoki at the site of present-day Tewa.

Figure 1.3. Hopi Village of Walpi



Second Mesa, located 10 miles west of First Mesa, is comprised of three villages, Mishongnovi, Sipaulovi, and Shungopavi. Mishongnovi and Sipaulovi occupy the eastern edge of the mesa-top, while Shungopavi is located southwest of these two villages, also atop the mesa. Shungopavi is the first of all the Hopi villages and was founded by the Bear Clan. Shungopavi was originally located at the base of the mesa but moved to its present site after the Pueblo Revolt. In addition to Shungopavi's move to the top of the mesa, a number of clans were sent to establish a new village (Sipaulovi) in order to ensure Hopi survival should Spanish reprisals after

⁵ http://www.hopi.org/images/photogallery/images/Walpi%20by%20Suzanne%20Page_gif.jpg

the Pueblo Revolt destroy the other villages. Mishongnovi was established by clans responsible for protecting Corn Rock, an important shrine just below the edge of Second Mesa. The original village was established at the foot of the mesa in about 1600 and was moved to its present site in the 1690s.

The villages of Oraibi, Kykotsmovi, Hotevilla, and Bacavi are located at Third Mesa, 10 miles west of Second Mesa. Established in 1100 AD, Oraibi is considered the oldest continuously inhabited settlement in North America. Hotevilla was founded in 1906 after a dispute in Oraibi led to a split in the village. Although Moenkopi is located 40 miles west of Third Mesa near Tuba City, it is a satellite of Oraibi, and is therefore considered one of the Third Mesa villages. The community was initially founded as a summer farming area for Oraibi and became a permanent settlement in the early 1900s. Figure 1.4 shows the village of Moenkopi.⁶

Figure 1.4. Moenkopi



⁶ http://www.hopi.org/images/photogallery/images/Moenkopi_gif.jpg

Contemporary theories have the Navajo⁷, an Athabascan-speaking people, arriving in the American Southwest from the north sometime between the 1300s and 1500s. They have lived in the area continuously ever since with the exception of a brief hiatus from 1864 to 1868. In 1864, after a series of battles with the U.S. Cavalry, most Navajos surrendered to Kit Carson and were forced to walk to the Bosque Redondo Reservation in New Mexico. In their four years of incarceration, half the population of the tribe died, primarily from disease and starvation. In 1868, Navajo leader Barboncito negotiated a treaty by which the Navajo were allowed to return to a part of their former homeland. Many contemporary Navajos still live the pastoral lives of their ancestors, tending their herds of sheep and goats. Figure 1.5 shows a traditional Navajo house, called a hogan.

Figure 1.5. Traditional Navajo Hogan⁸.
Note 55 gallon drum used for hauling and storing water.



⁷ Navajo is derived from a Tewa name. The Navajos refer to themselves as “Dine’” – the People (pronounced di nay). Navajo, Dine’, and Dineh will be used interchangeably throughout this testimony.

⁸ <http://www.bluecorncomics.com/pics/sauer8.jpg>

In addition to cultural differences, the Hopi being a sedentary, agricultural based, village dwelling people, while the Navajos were typically a nomadic, pastoral people, for decades central Black Mesa has been at the center of a land dispute between the Hopi and the Navajo Tribes, both of which consider the area their sacred and traditional homeland. From 1962 to 1977, the disputed land was proclaimed a "Joint Use Area" by a United States District Court, a development that pleased no one. In 1977, the Joint Use Lands were divided between the two tribes, with mineral royalties from this land to be split equally between the tribes. This ruling only intensified the political and emotional dispute between the Hopi and Navajo. While enlarging the existing Hopi Reservation by 900,000 acres, the ruling still left it entirely surrounded by the Navajo Reservation, a sore point for many Hopi. This decision also resulted in the relocation of thousands of Navajos and hundreds of Hopi off of the partitioned land in the 1990s, many of whose families had lived for generations in the Black Mesa area. The land dispute is still a cause of great trauma among the people of both tribes.

In the desert, water is life. This area typically receives less than 10 inches of precipitation a year. The N-aquifer system is the main source of water on Black Mesa; it is the only source of ground water for the Hopi Tribe and the roughly 27,000 Navajos living on Black Mesa. Over 500 wells, springs, and windmills obtain their water from the N-aquifer system, as does the well field that supplies the coal slurry pipeline used to move coal from the Black Mesa Mine to the Mohave Generating Station. Two other major water-yielding systems have been defined under Black Mesa: the C-aquifer (Coconino) system and the D-aquifer (Dakota) system. The D-aquifer system is of marginal to unsuitable quality for drinking and is the source of water to approximately 125 wells and springs in the area. The Wepo (C-aquifer) is of marginal to unsuitable quality for drinking. Only about 50 wells or springs obtain water from the Wepo Formation. A viable, functioning N-aquifer is essential for life on Black Mesa.

While the Hopi and Navajo may be ancient adversaries, they are united on one position — their springs and wells are going dry and the continued pumping of N-aquifer water to ship coal to Nevada for the Mohave Generating Station is a direct threat to their continued existence. This is their home. Hopi is a land-based culture with a land-based religion; the culture cannot exist in its present form anywhere but on Black Mesa.

Chapter 2 of this document to the Commission provides the testimony of two elderly Hopis on the importance of water to their culture and existence and their opposition to continued groundwater pumping for the coal slurry pipeline. Chapter 3 provides a similar discussion from a local Navajo perspective and the Attachments include responses from the Navajo communities in the area. Chapter 4 provides a summary of a new potentially serious development on Black Mesa - the recent emergence of sinkholes and fissures in the ground.

Chapter 5 discusses alternatives to continued Black Mesa groundwater use for coal transport. Chapter 6 provides a summary of the economic consequences that would be associated with closing the Black Mesa Mine. Chapter 7 provides a critique of the economics and environmental consequences of the continued operation of the Mohave Generating Station. Chapter 8 provides our conclusions and recommendations.

II. HOPI TESTIMONY – BLACK MESA TRUST

II.1. Testimony of Vernon Masayesva

My name is Kiimömtewa. It was given to me by my paternal aunts who are of the Bacavi or Reed Clan. I was born on Third Mesa, in a village called Hotevilla. When I went to white man's school, the teachers gave me the name Vernon. I will be 63 years old soon. I have a wonderful wife, four kind daughters and eight crazy but lovable grandchildren.

First, I need to briefly explain that my perspective on the impacts of Mohave Generating Station and Peabody mining on our culture and land comes from listening and learning from my elders who are also my teachers and advisors.

The knowledge I am giving to the Commissioners is classified as “su’ovang navoti” or surface knowledge in the Hopi way of sharing information handed down from our fathers. In the Hopi society, information is categorized into religious knowledge, which is privileged and therefore cannot be told to anyone who is not an initiated member of a religious society. Then there is clan knowledge, which is closely protected by members of clans. I am of the “paa’is’kyam” or Water-Coyote Clan. Therefore, I will be out of order if I share knowledge that properly belongs to, for example, the Water Clan people. Each Hopi community consists of clans. Each clan has a special obligation or duty to serve the entire community².

Finally, there is surface or common knowledge, which is open to the public, so to speak. It is this category of knowledge that informs my perspective on impacts of coal and water mining on our way of life, our beliefs and our environment.

² Hopi society is divided into clans. Each clan includes families that trace their origin to a common, often mythical, ancestor. Individuals trace their clan membership through their mother and women inherit property through their mother's clan. Of the original 75 clans, 34 still exist and are spread throughout the Hopi villages. Each clan is responsible for guarding a part of Hopi ritual knowledge, hosting ceremonies, and keeping and honoring certain sacred objects. Clan membership requires specific duties to be performed to fulfill the clan's responsibilities, and also determines what ceremonial offices an individual may hold.

According to oral history, our ancestors came from the south. One place of our origin is called Palatki, meaning “red house.” I believe this is somewhere in central Mexico. Hopi language is part of the linguistic family called Uto-Aztecan. Palatki and other great cities were destined to be destroyed, due to mankind’s ego and their obsession and quest for wealth and power. Consequently, the ancestors moved out in all directions, looking for a safe haven. After an untold number of years of traveling, they came upon a man working his cornfield in the heart of Black Mesa. Our people, “moti sinom,” or First People asked him if they could stay with him. The man who we call Ma’sawu said, “That is not my decision to make. That is your decision. You did the right thing by asking.” He then told of other races of people coming. They will come not in search of a peaceful place, but in search of wealth. With each step they will say, “This is mine.” They will claim the land, forests, lakes, minerals, even the sky and the oceans, he explained. I believe the Spaniards were first of a wave of people prophesized to come. Spaniards claimed all of aboriginal Hopi land for the King of Spain. Our people were forcefully baptized and converted to Christianity. Our religion was outlawed. Later came Americans, who under the guise of “manifest destiny” pretty much stole all land and minerals from indigenous peoples.

Therefore, Ma’sawu said, “You must always stay vigilant. If you fall asleep, the minerals, water and the land will be pulled out from under you. This is a desolate place, but it is a safe place. You have to work very hard each day to survive.” He then showed the people his planting stick, his ear of corn and his gourd of water. “These three things are all I have. Look around you, I am a farmer in a desert. But if you learn and accept my ways, my law, you will survive.” Our ancestors agreed to accept Ma’sawu’s way of life and, therefore, were given permission to stay. In return, they agreed to help steward the land. I call this agreement a covenant.

Students of Hopi, such as myself, are just now beginning to understand that corn, water, and the planting stick represent the cornerstone of a truly sustainable society. Corn represents food. Corn meal is the first meal a newborn eats on his or her 20th day. Two perfect ears of corn are kept on each side of the baby at all times. They are symbols of a protective mother during the first 20 days. Corn is used to bless the baby as part of the naming ceremony and is

offered to Father Sun when the infant is formally introduced. Each day the farmer offers corn meal to the sun and prays for rain.

Hopis say, water is life. Without water, no life is possible. Water works like blood in our body. Hopi word for water is “paahu.” When you drink water, we say “hiiko.” When you take a breath, we say “hik’su.” Hence, drinking is an act of breathing, of staying alive.

At our religious and kachina ceremonies (kachinas represents all forms of life) the priest prepares “paaho” for kachinam. Paaho comes from the word Paahu, water, and ho’hu, arrow. It literally means, “water arrow,” which symbolizes lightening or energy. The kachinam are asked to receive paaho and to take it to their home, then return as rain or snow to keep Mother Earth healthy and strong. After paaho is given out, the priest delivers a universal prayer for all living things, ending with the message, “Let there be life, let it be a good life and let it be forever.”

There is much, so much more to what I am telling you. I hope this little bit of information gives you an idea of why water is so central to our way of life.

As I speak and write, we are just past the halfway mark in the month of January. Hopi name for January is “Paamuya,” literally translated as “water month.” This is the time when we pray for a major snowstorm. Snow is key to a successful planting. Slow snow-melt is good for the earth and is necessary for young corn plants to develop deep roots before the blistering hot summer arrives.

February is “Powamuya” or month of purification. This is when Hopi search their souls. This practice of inner reflection is called “nat’wani.” It is the final ritual before planting. It is when Hopi prepare themselves emotionally, spiritually, and physically for farming.

Hopis are farmers in a waterless world. Our ancestors perfected techniques of growing corn with very little water. We are considered the world’s foremost “dry-farmers.” But technique is not the only means that counts. A farmer has to dedicate himself to taking care of his plants. Each day they pray for the plants. They care for them as they do their children. Some sing to them. Recently, I saw a picture of a farmer standing amidst his wilted cornfield,

victims of drought (Time Magazine). The farmer is quoted something to the effect that “farmers know what to do when it rains, but no one knows what to do when it doesn’t rain.” That is not exactly true as evidenced by a photo of a Hopi farmer standing in the middle of a healthy row of corn plants after three years of drought (Condé Nast).

Because water is life, it is sacred. Life is sacred. Because it is sacred we are forbidden to waste it. We are taught to use and reuse water. We are taught to say “kwaq’qwa” after each drink. It is our way of thanking the Creator for providing us water. Each time we drink from a spring we scoop up water in our hands and throw it towards the village. This is our way of inviting the water people to our homes. As children, we are told to make a sucking noise when we see rain in the distance to encourage rain to come our way. If wind comes and starts to block the rain from coming, we shoo the wind away with our hands. Water is used to christen newborn infants, Hopi priests bless the Kachinam with water in hopes we will be blessed in return with moisture. One half of the 12 villages have water-related names: Moencopi, Hotevilla, Bacavi, Shungopavy, Mishongnovi, and Shipaulovi. Many families have surnames relating to or describing water. For example; Yoyoki, meaning “It is raining”, Baatala: “water-glistening”, Talwi’p, :“lightening”.

Before the Europeans introduced deep wells, all of our drinking water came from springs that seep out along the fingertips of Black Mesa. All springs are entryways to the water world, the world of Water Serpent. Springs are also considered breathing holes for the underground body of water. Hopi say that groundwater “sucks in” or breathes in the rain, just like you suck in air to stay alive. Each time you suck in the air you must exhale. Aquifers act the same way. Aquifer is a living body of water, it breathes. It acts just like your body. If, for example, you die from a heart attack, the amount of blood will remain the same, but it will no longer circulate to all parts of your body. This is simple logic. It is Hopi knowledge, I call it Hopi science. But, it is science you cannot weigh, measure or quantify. Therefore, western science does not consider it to be true science. It is regarded more like Indian myth, inferior to western science.

All springs are important and sacred. One spring in particular, which is located about 12 miles east of the coal mine complex, is very central to our belief. This spring we call Ki’siwu is visited twice a year by most of the villages, once in February and again in July on the day before

Niman, Home dance. Special prayer feathers are prepared and deposited at this spring. Niman, or Home dance, teaches us that all living things will go home one day. Home is the water world. We will turn into clouds when we end our journey on earth. We will come down as rain or snow and begin our journey to the sea. There we will rest and return as clouds to bless the land with moisture. This is the sacred cycle in which we all play a role.

Hundreds of springs below the mesas are now dead or in the process of drying up. This is an indication that our aquifer is now seriously and irreparably out of balance. Something has gone wrong. The aquifer is slowly losing pressure. This IS the heart of the water crisis. When did it go wrong? Some say the culprit is Peabody Western Coal Co., which is pumping over one billion gallons of water each year from the heart of Black Mesa. Some say it is community and municipal pumping. Some blame it on drought.

There are Hopis who don't seem to be concerned about our water problems. They seem to have adopted the American "fix-it" mentality. Central Arizona Project is a classic example of "fix-it" American mentality. For Hopis who are worried about the gradual erosion of our beliefs, importing water will lead to further disrespect for spiritual importance of water. For them adopting this mentality will further erode our water-based belief and religion and tradition. This reverence for water does not register in minds of most American people because they see water as limitless commodity. There are limits to how much fresh water is available on earth and we must learn to live within those limits. I recently read an article in National Geographic, which explains that only 3% of the earth's water is fresh. Of that two-thirds is frozen.

Deep in the heart of our Hopi elders, there is great sorrow. The elders I talked with believe that our Hopi Tribal Council caused the water dilemma when they sold water to Peabody in 1966. The Council turned sacred water into a commercial commodity. They broke a sacred covenant with Ma'sawu, Guardian of the Earth, when Council approved the sale of water for \$1.67 an acre-foot and construction of a pipeline to transport coal from Black Mesa to Mohave Generating Station (MGS). A thorough investigation of water sale documents by a prestigious law firm failed to produce evidence indicating Hopi Tribal Council's approval of selling pristine water for \$1.67 per acre-foot. Documents do show the Council favoring construction of a rail to transport coal in 1965, but the General Counsel for Hopi Tribe intervened and changed Council

to vote in favor of a slurry pipeline! According to the distinguished Professor of Law, Charles Wilkinson, the Hopi-Navajo-Peabody lease was “born of treachery” and is illegal because John Boyden, former attorney for the Hopi Tribe, was also billing Peabody and acting as Peabody’s representative at the Utah Water Commission meeting. Investigators working for Professor Wilkinson uncovered these records of billings and meetings. I believe that even if our Council had turned down the sale of water and coal, mining would still have become a reality. Why? Because then Secretary of the Interior Stewart Udall and Arizona Congressional delegates needed a source of “cheap electricity” to make Central Arizona Project a reality. Black Mesa coal became that source of cheap power. By giving away water and coal at bargain basement prices (3.33% royalty rate for coal), Hopi and Navajo literally subsidized Peabody and owners of MGS. This subsidy is continuing to this day. Subsidies also came in the form of waivers of severance and possessory taxes forced on Navajo Tribe.

The elders believe that by abandoning our stewardship responsibility, we did a great injustice to future generations for which we will be punished. They believe rains no longer come because of our mistake. Valjean Joshevema, Sr., an elder from the village of Shongopavy, continues to sing a prophecy song that he learned from the elders of Oraibi (considered to be the oldest, continuously inhabited community on the North American continent) when he moved there in early 1900s. The song foretold the time when Hopis will sell rainwater. Then as punishment they will pack up their belongings and begin their exodus from Black Mesa. With “tin-cups” in their hands they will visit springs that used to provide water, now dead. They will scoop out the dirt hoping to find signs of water.

In May of 1971, the elders gave this warning, “Drawing huge amounts of water from beneath Black Mesa will destroy harmony....Our land will shake like the Hopi rattle; land will sink, land will dry up.” Jason Tenakyouma, an elder from Hotevilla, believes one of the ancient prophecies is very near to reality. It is prophesized that we will suffer greatly when water is “torn up,” paatsiki. This means destruction of the hydrologic balance.

So, a combination of factors has caused the present water crisis. But one thing is for certain—Peabody’s pumping is a major cause of this hydrologic imbalance. They alone pump approximately 70% of the total volume of water pumped annually from the confined portion of

N-aquifer. Their spokesperson continues to paint a rosy picture of Navajo aquifer. Their hydrologists have created the state-of-the-art computer modeling, which according to press releases, clearly shows Peabody pumping as having no significant negative impact on the N-aquifer. N-aquifer is robust, they claim. It contains so much water that by the end of mining they will use just a drop of water from a vast sea of river underneath Black Mesa. They illustrate this by saying they will have used only “one cup” from a 55-gallon water drum during the “life-of-mine.”

We hope this is true, but even if it is, the springs are continuing to die because Peabody’s massive water harvesting is depressurizing the aquifer, which is akin to destroying its heart. Now our Navajo neighbors are noticing sinkholes and cracks in areas adjacent to Black Mesa Mine and very close to Ki’siw, which I spoke about earlier.

What is causing it? Can someone explain what is happening? Where is our trustee, the federal government? Are they waiting for an accident to be reported before they carry out their regulatory trust responsibility?

Hopi and Dinéh deserve environmental and economic justice. Owners of MGS have enriched themselves at our expense. California ratepayers enjoy cheap electricity for many years at our expense. While others are enjoying benefits, many people of Black Mesa live in abject material poverty. Running water and electricity are non-existent in most homes. The Dinéh people drive over 30 miles just to pick up their mail. They are denied basic American privileges that most Americans take for granted. In California the non-citizens, the migrant farm workers, are provided safe and decent housing by law. On Black Mesa, the first citizens of USA, whose resources are exploited to enrich corporations, continue to live in extreme poverty. This is a disgrace crying out for justice. I invite you, Commissioners, to visit us. To see for yourselves the picture I have painted so that you will find in your hearts the reason and need for some form of economic justice for the people of Black Mesa.

Kwaq’kwa, Thank you

Figure 2.1. Hopi Village of Walpi¹⁰.

II.2. Testimony of Jerry Honawa

My name is Jerry Honawa. I am from the village of Hotevilla. I am the leader of the Rabbit-Tobacco clan and am keeper of the sacred pipe. I want to share with you the knowledge handed down from my grandfather.

Water is first. It is the most sacred gift from the Creator. It connects us to the Creator. Water feeds all living things. It feeds the flowers. It feeds the birds, butterflies, and insects. It feeds the animals. It feed the underground waters. It feeds the plants, and trees. It feeds me and you.

¹⁰ http://www.hopi.org/images/photogallery/images/Walpi%20by%20Suzanne%20Page_gif.jpg

Water connects all living things. I am connected to flowers, birds, the animals and trees. I am connected to you through water. When my body dies, my body will rise up and join the cloud people, who are my ancestors.

Therefore, in my capacity as “keeper of tobacco pipe,” in my clan (Rabbit), I have responsibility to pray each night, each morning for rain, for snow so that life will continue. I pray for good health not only for my Hopi people, but also for people and all living things throughout the world. A Hopi priest considers all people of all color as his children. He tries to be a good steward of the land at all times.

Our ancestors were told of great wealth beneath us. Wealth in the form of water, coal and other minerals. They were warned that someone will come someday with promise of great wealth. He will use money to trick us into giving up the minerals.

This has happened. Peabody came and tore up our land. Tore up our waters. They drilled deep wells at the palm of our hand, which is Black Mesa. They diverted water which should be going to the fingertips. They blocked water which should be feeding our springs and washes. They have done so without any consideration for our way of life and future generation of people yet to come. I try to be their voice.

They are destroying my religion by tearing up the water, my connection to the Creator. All because they want to make money. Money is their god.

White man is very smart. Why don't they figure out ways to transport coal? Why don't they figure out a way to mine without destroying our sacred land?

My grandfather said we are to use the coal, but under these four conditions.

When the time is right
When there is a right way to do it
The right place to do it
Finally, for the right purposes.

He also said something interesting. He said we were to use “coal’s waste” first. It is hard to explain what he meant, but I have read there is gas in coal veins that has a bad smell. This gas should be used first.

We are going to have a discussion about the four conditions.

Blasting and slurring is not the right way to mine. It is wrong. It is destroying the breath of the aquifer. It is killing the springs which are its breathing holes. By killing the springs, Peabody is eroding my religious practices. My life and the lives of my people deserve respect. Respect I have yet to see. All I have heard is deception. Peabody has not spoken the truth. They deceive us when they say they will use only a cup of water and that cup will recharge quickly. Here we receive very little rain so how can it recharge? The N-aquifer cannot recharge. The water was put there an untold number of years and was to serve us into eternity. Navajo aquifer, which contains pristine waters, is nonrenewable contrary to what Peabody scientists are telling us. It is our savings account. Peabody is dipping into our savings account. This is criminal and Peabody and United States government will have to pay for the damages.

Why is it so hard for White man to understand the importance of water? The spirituality of water?

I hope my words will wake you up before it is too late. Thank you.

CHAPTER III – DINE' TESTIMONY – TO'NIZHONI ANI¹¹

My name is Nicole Horseherder. I'm Chishi dine'I (Chirichauhua Apache Clan). My father is French Canadian and so is my paternal grandfather. The Kiyaanie (Towering House) people are my maternal grandfathers. I grew up east of Big Mountain where people of my clan reside, but even at a young age I was told who my relatives were and found out that I had many in all directions; Big Mountain, Blue Canyon, Howell Mesa, Black Spot Mountain and Forest Lake. Except for the years I spent at University, I have lived here all my life.

Three years ago I built a small home at Tsebiniitaahotso, approximately 10 miles NE of Big Mountain. There are springs near my home, Tseltadiilini, Ma'ii tsoh bitoh, Tsebiniitaahotso, Dahsani toh. Of these springs near my home only Tseltadiilini still produces enough water to drink. Ma'iitsoh bitoh is wet but there is not enough flow to drink. The others are dry. Throughout my life I've drank from dozens of springs all over Black Mesa. Many of these springs have reduced flow in recent years.

There are two places that I know of where water used to come to the surface through the sand, otherwise known as a seep. Seeps have always had a mysterious nature. Water would rise to the surface swirling and bubbling and collect in pools on the wash beds. After a period of time the water disappeared back into the ground, coming to the surface again later. During the time water rose to the surface people would collect water and animals drank. My mom tells me about the one in Oraibi Wash near Tsebiniitaahotso. My grandparents would wake my mom and her sisters at 4 a.m. to take the sheep to water. At dawn each morning this seep would come alive. As the sun rose the water slowly diminished and wouldn't be seen again until dawn the next day. The other seep is Tohanaldoh in the Dinnebito Wash just east of Big Mountain. My uncle Percy Deal and cousin Katherine Smith described this place in much the same way. This seep used to produce water regularly. People would scrape the mud so that deep pools would form and they could collect the water. Both of these places are dry today.

¹¹ An important Navajo custom is to introduce one's maternal and paternal clans on both sides of the family. In the Navajo way, this is how others know where you came from. Navajo children are "born to" the mother's clan and take her clan name, and are "born for" the father's clan. Therefore, Navajos precisely know who they are through identification by their mother's, father's, maternal grandfather's and paternal grandfather's clans.

Springs are very important to my people. We live in a desert and water is very valuable. We did prayers and offerings last October at Tseltadiilini, which is located about 1 mile NW of my home. This offering and prayer served two main purposes. The first is so that water in all forms and from all places will continue to have pity on us and bless us. These prayers and offerings are made so that water continues to be available, not only for ourselves but every extension of ourselves: our children, cornfields, animals, plants, medicines, tobacco, relatives, and all people. Prayers are made so that the balance and harmony between the earth and sky can be maintained because together the balance is crucial to the water cycle, hence the cycle of life. The second reason for the prayers and offerings to the spring was to be initiated by water. During the time offerings are made to sacred springs, the sacred names and nature of water is revealed. Since I had taken on this effort to educate my people about water protection and preservation, my husband and I were advised that we are dealing with the sacred element of life. Elders warned us that we have no business discussing something very sacred, especially at the national level, if we were not initiated first. During the ceremony the sacred names of water was revealed to us. Today if we were called upon to offer a prayer for water we are qualified. By the same token, the communities on Black Mesa feel confident about our efforts to speak on their behalf of the usage of our groundwater.

The life that I know here is still similar in many ways to when I was a child. Our meals were cooked at an outdoor firepot. We had no electricity and our floors were dirt. We drank and collected water from ponds, springs, and seeps. We walked the land each day either at play, herding sheep, riding horses, or traveling about. Our knowledge of springs, plant life, medicines, and wildlife seemed like common sense.

Today we still heat our homes in the winter with wood burning stove. About 15 years ago some people in the community began receiving electricity but I don't expect electricity to my home for at least another 2 years. My daughter catches a 1 and half hour bus ride to school at 6:30 am each morning. We travel 30 miles over dirt roads to pick up our mail. We don't have running water. We have to rely less and less on our traditional springs because most springs produce so little water or none at all today. Instead we have to hauling water from wells as far away as 30 miles away. In my family we use approximately 200 gallons each month for

cooking, bathing, and other household use. By recycling bath and rinse water we use about 5 gallons total each time we bathe, between 3 people.

My point is that this type of life here teaches you the meaning of conservation, respect, and sacred. When you have very few modern day conveniences and material goods have little practical use, then the importance of our Native Religion is evident. We know where those life sustaining elements such as water come from. We know it doesn't start at a faucet. We understand our role in the crucial balance that must be maintained and so we give thanks and make offerings, not just for ourselves but all living things. Each new generation that accepts the way of life out on Black Mesa, and understands the value of water and life. And our water is disappearing.

The Navajo (Diné) People originated between the four sacred mountains of the Southwest, Tsisnaajini¹², Tsoodzil¹³, Dook'oosliid¹⁴, and Dibe nitsaa¹⁵. The creator brought us up out of the earth to this place within the four sacred mountains to live out our lives as human beings. We are herdsman, farmers, hunters and gatherers. Often it is said that the Diné arrived to this area later than other peoples and that we came across a land bridge into Alaska and then migrated south. This is nothing more than an Anglo theory. We believe we have always lived here. In 1864 the Diné people finally submitted to the U.S. Calvary, but only after a "Scorched Earth Campaign" was waged on us. My people were imprisoned for 4 years in Bosque Redondo about 300 miles east of Fort Defiance. Upon release we returned to our land within the 4 sacred mountains and with the aid of federal officials the Navajo Nation Government was established and our children were sent to boarding school.

It is ironic that one of the first actions of business after the establishment of the Navajo Tribal Government was to pass a resolution that would relinquish the tribal authority over to a

¹² Mount Blanca (Dawn or White Shell Mountain), Sacred Mountain of the East, near Alamosa in San Luis Valley, Colorado.

¹³ Mount Taylor (Blue Bead or Turquoise Mountain), Sacred Mountain of the South, near Laguna, New Mexico.

¹⁴ San Francisco Peaks (Abalone Shell Mountain), Sacred Mountain of the West, near Flagstaff, Arizona.

¹⁵ Mount Hesperus (Big Mountain Sheep or Obsidian Mountain), Sacred Mountain of the North, La Plata Mountains, Colorado.

white federal agent. And so exemplifies the way outsiders have adversely controlled our government. Since that time it seems like through one resolution after another we have been deceived into giving away everything else; our water rights to the Colorado River, then the right to collect taxes on coal and leased land. We sold our coal at rock bottom prices and our precious water at \$1.67 per acre/ft. Today's prices are just as absurd, we continue to accept less than .01 cents (.0027) a gallon for our water. Our coal powers the pumps that run Central Arizona Project (CAP). Our coal generates the electricity for millions of people in California, Nevada and Arizona. The Navajo Nation does not receive a single drop of water from CAP or a single kilowatt of electricity from Mohave Generating Station. Further, the Navajos (Diné) people on Black Mesa do not receive even 1% of the royalties that is paid to the Navajo Nation from coal and water sales. For more than 30 years we have been the source of cheap coal, water, and electricity. We have kept costs down and profits high for both Peabody Coal Company and the owners of Mohave Generating Station.

There are 110 Chapters across the Navajo Reservation. These are local government entities, similar to your county governments. Each Chapter is authorized to do business on behalf of their respective communities so long as there is a quorum (usually 25 voters). They address things that impact the lives of the people in their area, such as grazing disputes, how to spend Chapter money, and other issues. The Navajo Nation is divided into 5 Agencies. The agencies are like your states. Most of the Black Mesa region is in the Central or Chinle Agency. There are 13 Chapters in Chinle Agency. A small part of the northern end of Black Mesa is in the Western Agency. Council Delegate(s) are elected to represent a Chapter or Chapters (depending on population) like senators or congressmen. The Council Delegate serves as a representative at the central government in Window Rock, the Navajo Nation Capital. The 88 Council Delegates make up the Legislative Body of the Navajo Government.

When we began addressing the N-aquifer issue we contacted all Chapters in the area of the N-aquifer. These were almost all the communities within the Chinle Agency and the communities of Tuba City, Shonto, and Kayenta, which are within the Western Agency. We have the support of all these communities. We have presented and educated more than 130 times in Chapter meetings and other community organizations including the Kayenta Mine Union and

Hopi Partitioned Land (HPL) residents. The petitions from HPL residents are important because they are often not considered as having any representation in either Navajo or Hopi government.

The 11 Chapter resolutions are included in Appendix I. These 11 Chapter resolution authorizes us on behalf of our people within the objectives and purposes of the resolutions. The resolutions request to “End the pumping of the N-Aquifer by Peabody Coal Company and find an alternative non-water based source of transportation by 2005.” In addition the resolutions requests for investigation of wells and the land: i.e. sinkholes and springs. Further requests include the enforcement of the “Water Rights and Replacement” law.

I have a hope for my people of Black Mesa. I don't wish for new homes or electricity to every home although that would be nice. Instead I envision for my people a chance to explore and develop sustainable economies and renewable energy. Why? Because Black Mesa is not just a place where a lot of elderly Navajos are living out the rest of their lives as shepherds and farmers. Black Mesa is our home. I'm 33 years old and I look forward to living a life as a farmer, rancher. I want to be able to raise a family and give them the foundation of our language and culture. This is their birthright. I'm only one of hundreds of people in the same generation as myself who call Black Mesa home. So I want to be clear to the Commission that it's not just the elders who are concerned about the Coal Companies and Energy Companies operations for the last 30 years. But it's the elders who still have the authority. They still carry that responsibility and right as leaders, mentors and decision makers in our communities and our society as Diné people. This is the reason To' Nizhoni Ani Organization has an Advisory Council of only Elders. TNA is also advised on a regular basis by Medicine People all over the Navajo Nation.

While the rest of America has prospered and moved forward, the standard of living here on Black Mesa has changed little from when my grandparents were young. Through our coal, water, and energy we've managed to widen the gap between the rest of America and life on Black Mesa. Our children desire education, jobs, and a chance to make a living just like yours do. We wish for them to grow up in a healthy environment, just like you do.

Things are getting worse for the people on Black Mesa. Thirty years of strip-mining have devastated the land, and disrupted the life of many people. Many of their testimonies are found in Appendix II. Now the springs are drying up and sinkholes and cracks are appearing on the land. I am afraid for my people, for our way of life. We have to protect the water and land, for that is where we live. As the Chapter Resolutions show, the local people are united in this position. We have to stop the groundwater pumping.

CHAPTER IV – SINKHOLES AND FISSURES ON BLACK MESA – TO’NIZHONI ANI

My name is Marshall Johnson. I was born and raised near Todaadit’aah. I’m Ashihi (Salt Clan). My paternal clan is TI’izi lani (Manygoats). My maternal grandfathers are Haashk’aan haadzohi (Yucca fruit). My paternal grandfathers are Honaaghaahnii (One that keeps watch).

I first noticed unusual cracks in Oraibi Wash on Route N41 about 10 years ago (approximately 1992). I didn’t ask questions, I didn’t know what it was or what it could be from. I noticed similar unusual holes and cracks again near my mom’s summer home in the To Nizhoni Valley about the time it was built, 6 years ago (about 1996). My mom first noticed them around that same time and put logs in the holes to prevent livestock from falling in. As I drove back and forth from my moms summer camp to the highway doing chores and taking care of livestock I noticed more sinkholes and cracks in the ground along the way.

By the time I started working on this issue to preserve the N-Aquifer and committed my time to educating my people about the issues regarding the N-Aquifer, I started taking pictures of the sinkholes and cracks. I starting spending a few days a month tracing them, first by car, then on foot and horseback. I walked one summer day with my 17 month old baby and traced at least 4 miles of these cracks and holes from ‘Adahiili to the west side of Forest Lake Chapter . To date, I traced these sinkholes and cracks in each of the following areas:

- a. From Red Sliding Rock in the N. Pinon Quadrant along the west side of Dinnebito Wash all the way to Highway 264;
- b. From Red Sliding Rock the trail Y’s, one going northeast into the To Nizhoni Valley and the other goes north towards the mine lease area.
- c. Random locations in the lease area including various reclaimed areas.
- d. Just east of Kayenta Mine in Oak Ridge.
- e. Blue Gap Chapter area.
- f. From Keetsiili down along the Oraibi Wash to Highway to 264.

These sinkholes and fissures, for lack of a better term, are appearing everywhere. The following photo labeled Figure 4.1 shows a crack that is about 30 yards long (bag in foreground

and person in background provide scale). It ranges to about 6 inches to 4 feet in depth. This crack is located about 6 miles northeast of Forest Lake Chapter.

Figure 4.1

Waypoint#	Location	Type	Distance	Elevation
.028	N36'19 W110'13	Sinkholes	47.92	6903



The next photo (Fig 4.2) was taken southeast of Big Mountain on the west side of Dinnebito Wash. The crack in the ground runs northeast perpendicular to the wash in the distance. The crack runs approximately 80 yards total. It is prominent since there are no other cracks nearby like it.

Figure 4.2

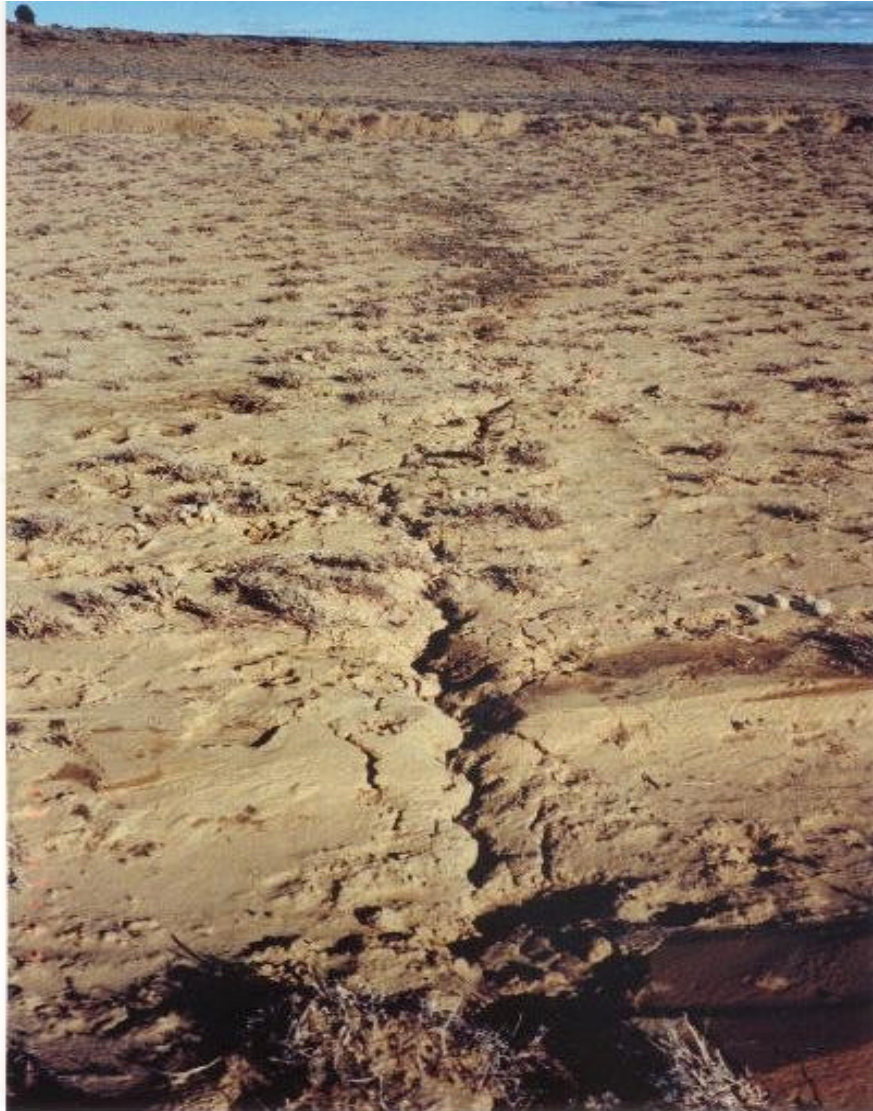


Figure 4.3 shows the continuation of the previous photo (Figure 4.2) with the crack running southwest. Notice the vegetation along the crack.

Figure 4.3



Figure 4.4 was taken approximately 8 miles north of Forest Lake Chapter, in the Peabody lease boundary area. Ground sunken in forming a dish, about 4 foot in diameter and what seems like 1 foot in depth. Notice dark hole in center (below newspaper) indicating that depth is deeper than what appears. Photo was taken prior to GPS unit and digital camera became available.

Figure 4.4



Figure 4.5 shows a dry spring. Tse adziz, “Rocky arroyo”, is located 1 mile west of Keetsiili Chapter House. The residents claim that this spring produced water year around and is now dry for the last 5 years, since approximately 1997.

Figure 4.5

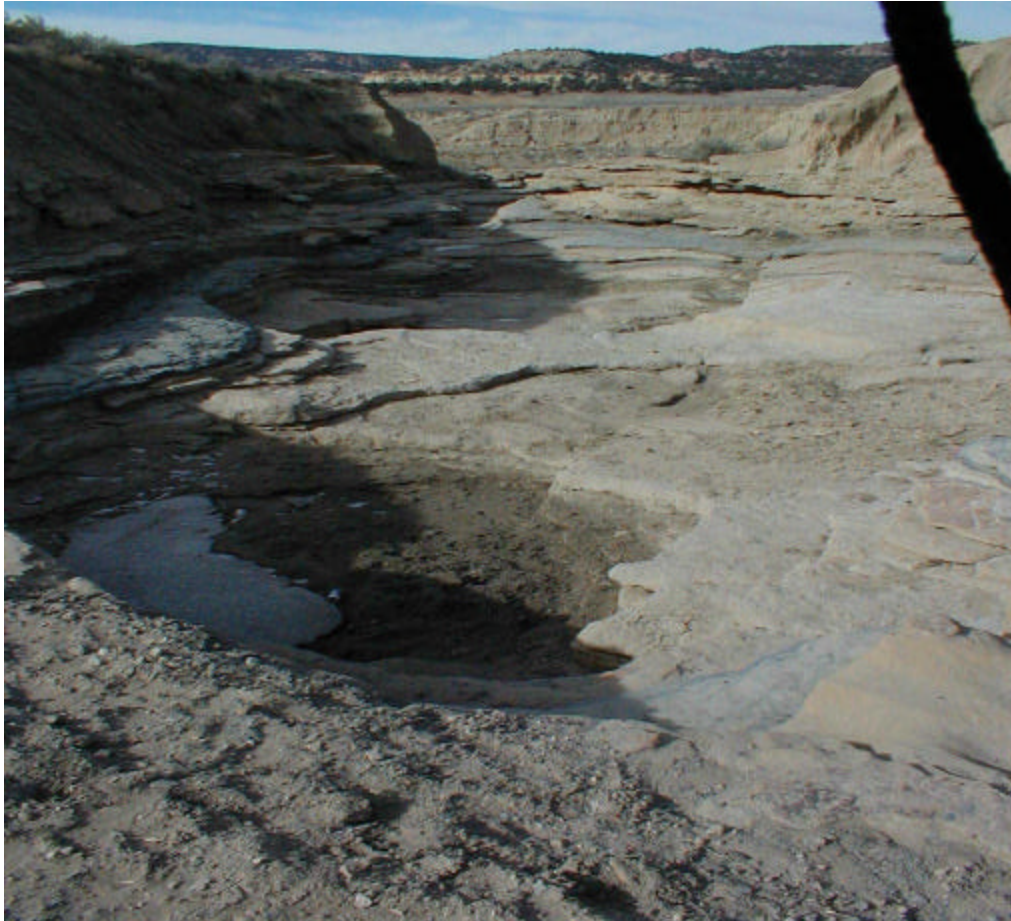


Figure 4.6 shows a large area that has collapsed. It is approximately 50 feet in diameter and 8 foot deep. This photo was taken just east of Big Mountain (in the distance) on the east side of Dinnebito Wash.

Figure 4.6.

Waypoint	Location	Type	Distance	Elevation
.014	N36'14 W110'23	Sinkhole	21.63NE	6378



Figure 4.7 shows a dry spring west of the Kayenta Mine area. This spring produced water year around until about 2 years ago (2000).

Figure 4.7.

Waypoint	Location	Type	Distance	Elevation
.008	N36'31 W110'26	Dry Spring	33.61	6397

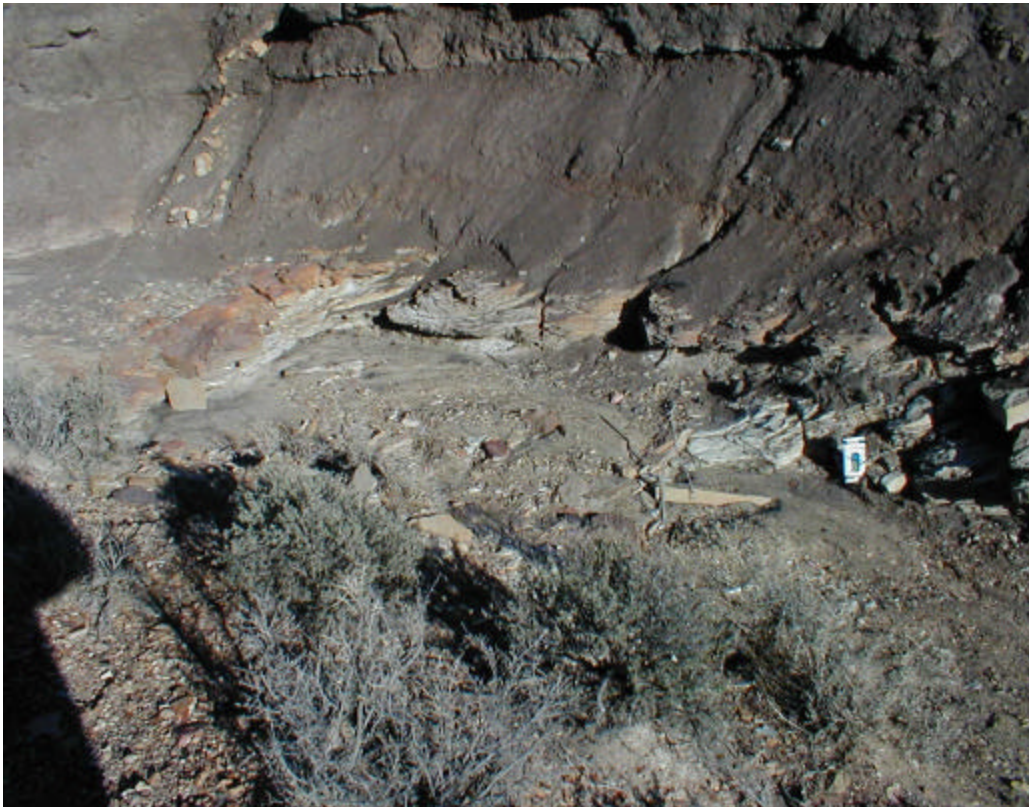


Figure 4.8 was taken just east of Forest Lake Chapter (in the background). This photo shows at least 3 consecutive sinkholes. It is typical to see holes appearing within several feet of each other. The sinkhole in the foreground is about 5 feet in diameter and the other two near the center of the photo are about 3 feet in diameter. Each sinkhole is about 3 feet deep or deeper.

Figure 4.8

Waypoint	Location	Type	Distance	Elevation
.015	N36'17 W110'17	Sinkholes	20.45SE	6628



I have spent the last year finding, documenting, and recording sinkholes, cracks, fissures, springs, and obtaining testimony from residents around where I and my mother live. I have a new fear about what is happening to the land through the last 30 years of mining, slurry line operation and producing power for the millions of people other than ourselves. What is happening to us Diné (Navajos) living in the area is a great tragedy on the part of our governments, coal company, and energy companies. It is a direct threat to our way of life, our land, and our water. As the people of Black Mesa we have been misled with little or inadequate information, half truths even, about the lease agreements and promises made by Peabody Coal Company. The cheapest means to get the coal to Mohave meant exploiting the people from whom they took it. We are left with the land that is collapsing and the springs that are drying up.

I find it ironic that Peabody Coal Company stresses safety on the job site. They have great signs that get the safety message across to all that enter the lease area where they are mining. Yet all over Black Mesa these cracks, sinkholes are appearing, creating a totally unsafe environment for anyone out riding a horse or animal out grazing. It is dangerous for any person out herding, farming, picking wild plants or medicine. There are two incidents that I want to mention to support my point. In the first incident a horse and rider fell into a sinkhole near Highway N41, between mile marker 9 and 10. Both horse and rider were badly bruised and cut but no broken bones (Neeshie Gene, 2002). The second incident involved my mothers own herd of sheep. About 4 years ago a couple of sheep walked into the sinkholes in the To Nizhoni Valley in the winter time. She was not able to rescue them from the fall and they died. For our people making a living means being outdoors. And the outdoors is becoming more and more unsafe.

While Southern California enjoyed cheap coal-fired electricity from the coal and water from our mesa we have experienced a decrease in our standard of living. Billions of dollars of electricity have been produced using our coal and our water and we still do not have electricity or running water, and live in homes with dirt floors. What kind of justice is there in that? I would like the Commission to take these facts into consideration when they look at the sacrifices that the people of Black Mesa have had to accept so that the rest of the nation can have electricity.

The fact the ground is collapsing means something is happening underneath. It is happening not just in one area, but in many areas of the mesa. Men I've talked to say that ground subsidence is one of the textbook symptoms of an aquifer collapsing. Aquifers collapse because the water has been taken out. And they say that when the aquifer collapses it compacts, and cannot be restored. Commissioners in California, we need our water to survive here. The groundwater pumping of the N-aquifer has to stop. Our lives depend upon it.

V. WATER

V.1 Water On Black Mesa

In any desert, including the American Southwest, good quality water is an incredibly rare—and valuable—resource. It is water that first drew people to this place, it is water that concerns them now, and it is water—or lack of water—that will determine their future. It is little wonder that the Hopi originally settled Black Mesa over a millennium ago. On and around Black Mesa are approximately 175 springs, the greatest concentration on the southern “fingers” of the mesa, where the Hopi settled¹⁶. Surface outflow from the N-aquifer occurs mainly as flow in Moenkopi Wash and Laguna Creek and as springs near the boundaries of the aquifer¹⁷.

Water from the N-aquifer is the highest quality water in the region, with low dissolved-solids concentrations, low chloride concentrations, and low sulfate concentrations. For example, on average, the concentration of dissolved solids in water from the D-aquifer is about seven times greater than that of water from the N-aquifer, the concentration of chloride ions is about 11 times greater, and the concentration of sulfate ions is about 30 times greater¹⁸.

The Bureau of Indian Affairs, the Hopi Tribe, the Navajo Nation, and the small towns in the area tap the high quality N-aquifer water system using approximately 70 wells. This domestic use has increased from about 300 acre feet in the early 1970s to current levels of about 3,000 acre feet per year. Peabody has been using eight wells to withdraw approximately 4,000 acre-feet of water per year since the early 1970s¹⁹. Thus, more than half (almost 60 percent) of the total

¹⁶ Hopi Tribe, 1994 305(b) report.

¹⁷ Monitoring the Effects of Ground-Water Withdrawals from the N Aquifer in the Black Mesa Area, Northeastern Arizona, USGS Fact Sheet 064-99.

¹⁸ Eychaner, J.H., 1983, Geohydrology and effects of water use in the Black Mesa area, Navajo and Hopi Indian Reservations, Arizona: U.S. Geological Survey Water-Supply, Paper 2201.

¹⁹ Ground-Water, Surface-Water, and Water-Chemistry Data, Black Mesa Area Northeastern Arizona - 1999, U.S. Geological Survey Open File Report 00-453.

water withdrawn annually from this pristine water source is used for a single purpose—shipping coal to Nevada²⁰.

The impact of withdrawing so much water from the N-aquifer is starting to show²¹. Almost 170 million tons of Black Mesa water have been used to ship coal to Mohave. The following Table 5-1 from the 2001 USGS report²² shows that the median water level has dropped 1.2 feet for 15 monitoring wells in the unconfined²³ part of the aquifer and 31.0 feet for 18 monitoring wells in the confined²⁴ part of the aquifer since the “prestress” period – prior to the opening of the Black Mesa Mine. Of even more urgent concern, approximately a third of the wells in the confined area of the aquifer have experienced water level drops of about 100 feet or more.

²⁰ Ground-Water, Surface-Water, and Water-Chemistry Data, Black Mesa Area 2000–2001 and the 1988 USGS Numerical Model of the N Aquifer, U.S. Geological Survey Water Resource Investigation Report 02-4211.

²¹ Peabody has withdrawn over 40 billion gallons of water and shipped it to Nevada since the Black Mesa Mine started operation.

²² Source: Ground-Water, Surface-Water, and Water-Chemistry Data, Black Mesa Area 2000–2001 and the 1988 USGS Numerical Model of the N Aquifer, U.S. Geological Survey Water Resource Investigation Report 02-4211. Table 4, page 60.

²³ The unconfined part of the N-Aquifer is defined as areas where the underground water level is below the top of the aquifer (often referred to as recharge areas) and occur primarily around the periphery of Black Mesa.

²⁴ Confined is defined as where the water levels are above the top of the aquifer. This is often referred to as the “pressurized” area and occurs primarily on the top and sides of Black Mesa.

Table 5-1. Water Level Changes in Wells in N-Aquifer, Black Mesa, prestress period to 2001.

[Dashes indicate no data. Do., ditto; R, reported from driller's log]

Common name or location	Bureau of Indian Affairs site number	Change in water level from preceding year, in feet ¹		Water level, in feet below land surface, 2001	Prestress period water level ²		Change in water level from prestress period to 2001, in feet
		1999–2000	2001		Feet below land surface	Date	
Unconfined area							
BM observation well 1 ³	8T-537	0.0	-0.3	374.5	374	(⁵)	-0.5
BM observation well 4 ³	2T-514	-1.0	+4	216.9	⁴ 216	(⁵)	-9
Cow Springs	1K-225	.0	(⁵)	(⁵)	60	07-04-54	(⁵)
Goldtooth	3A-28	(⁵)	⁶ -5	231.2	230.0	10-29-53	-1.2
Long House Valley	8T-510	-9	-7	123.6	99.4	08-22-67	-24.2
Northeast Rough Rock	8A-180	-7	-5	44.4	46.9	11-13-53	+2.5
Rough Rock	9Y-95	+3	(⁷)	(⁷)	119.5	08-03-49	(⁷)
Do	9Y-92	-5	-4	165.7	168.8	12-13-52	+3.1
Shonto	2K-300	-8	+4	171.9	176.5	06-13-50	+4.6
Shonto Southeast	2K-301	-4	-3	288.9	283.9	12-10-52	-5.0
Do	2T-502	-9	-7.6	423.0	405.8	08-22-67	-17.2
Tuba City	3T-333	-1.2	+2.3	29.7	23.0	12-02-55	-6.7
Do	3K-325	-5	+3	201.7	208	06-30-55	+6.3
Tuba City Rare Metals 2	---	.0	+8	51.8	57	09-24-55	+5.2
Tuba NTUA 1	3T-508	-4.9	-6	67.8	29	02-12-69	-39
Tuba NTUA 3	---	⁶ -3.6	-1.0	61.1	34.2	11-08-71	-26.9
Tuba NTUA 4	3T-546	-8	-3.4	64.1	33.7	08-06-71	-30.4
Confined area							
BM observation well 2 ³	8T-538	-1.3	-2.9	204.4	125	(⁵)	-79
BM observation well 3 ³	8T-500	+8.9	-7.0	151.5	⁴ 55.0	04-29-63	-96.5
BM observation well 5 ³	4T-519	-3.3	-1.9	406.0	324	(⁵)	-82
BM observation well 6 ³	---	⁸ -4.3	⁸ -4.4	838.0	⁴ 697	(⁵)	-141
Chilchinbito PM3	---	⁶ +8	-5	424.0	405.3	09-25-65	-18.7
Forest Lake NTUA 1	4T-523	-4.8	(⁵)	(⁵)	1,096R	05-21-82	(⁵)
Howell Mesa	3K-311	(⁵)	(⁹)	453.6	463.0	11-03-53	+9.4
Howell Mesa	6H-55	⁶ -1.0	+2	270.0	212	07-08-54	-58
Kayenta West	8T-541	-1.6	-4.1	290.5	230	03-17-76	-60
Keams Canyon PM2	---	-4.5	+6.0	461.3	292.5	06-10-70	-168.8
Kykotsmovi PM1	---	-18.7	+2.3	230.6	220	05-20-67	-11
Kykotsmovi PM3	---	(⁵)	(⁹)	240.1	210	08-28-68	-30
Marsh Pass	8T-522	-6	-1.7	130.7	125.5	02-07-72	-5.2
Piñon PM6	---	(⁵)	-10.8	873.6	743.6	05-28-70	-130.0
Rough Rock	10R-119	-0.8	+0.8	255.2	256.6	12-02-53	+1.4
Do	10T-258	-5	+3	309.0	301.0	04-14-60	-8.0
Do	10R-111	-4.0	+1.3	193.7	170	08-04-54	-24
Sweetwater Mesa	8K-443	-4	+3	539.7	529.4	09-26-67	-10.3
White Mesa Arch	1K-214	-3	+6	220.0	188	06-04-53	-32

¹The dates of water-level measurements were changed from fall-winter (October 1999–February 2000) in the last monitoring report (1999) to spring (March–May 2001) in this report (2000–2001). This interval between measurements was approximately 16 months instead of the usual 12 months. Subsequent annual water-level measurements will be made in the spring.

²Prestress refers to the period of record before appreciable ground-water withdrawals for mining or municipal purposes—about 1965. For wells that had no water-level measurement before 1965, the earliest water-level measurement is shown.

³Continuous recorder. Except for well BM3, prestress water levels were estimated from a ground-water model (Brown and Eychaner, 1988).

⁴Prestress water levels for indicated wells were changed from previous Black Mesa monitoring reports to more accurately represent prestress conditions. The water level in BM3 was 77.1 feet in 1998 report and 60 feet in 1995–97 reports. The water levels were 217 feet in BM4 and 735.6 feet in BM6 in 1995–98 reports.

⁵Water level not measured because of obstruction in well, no access to well, or not visited.

⁶Change in water level from last measurement 2 to 4 years earlier.

⁷2001 water level influenced by pumping.

⁸Water level of 836.7 feet reported in 1999 monitoring report was incorrect. Correct water level was 833.6 feet.

⁹Change in water level not shown because last measurement was more than 4 years ago.

Evidence that the N-aquifer may be suffering damage due to excessive pumping is causing considerable distress among the people who live in the area, as the previous chapters illustrate. Water is physically precious and spiritually significant to the Native peoples in this desert region of the Southwest. The indigenous peoples on Black Mesa are seeing their precious springs dry up²⁵ and the water levels drop in their wells. In this, some Hopi elders see the beginning of the fulfillment of an ancient prophecy—if their sacred springs dry up they will have no place to live. If the Hopis cannot live in their villages on the mesas, nor practice their religion and traditions, the oldest living civilization on the continent could be in danger of disintegrating.

This concern has been exacerbated by efforts to create models to simulate the N-aquifer system and predict the effects of taking from that system more than 7,000 acre feet of water a year. A recent effort to develop a model other than the one used by the USGS stated its results thusly:

Some cells in the calibrated 3D model go dry during the future pumping simulation as early as 2009, and are associated with pumping wells mainly at Tuba City, but also at Kayenta and Polacca. The reason for this is probably due to the increasing tribal community pumping in the area combined with calibration results that indicate higher simulated heads than observed (possibly due to low transmissivity assigned to this area during calibration).²⁶

To translate, this model shows the wells in the Tuba City area going dry by 2009²⁷.

Tuba City, one of the largest towns in the area²⁸, is immediately adjacent to Moenkopi, one of the primary farming areas of the Hopi. Kayenta is the other significant town in this area, located beyond the northern edge of Black Mesa.

²⁵ It is interesting to note that the most significant and holy of the Hopi and Navajo springs are not being monitored for water level changes. The USGS monitors four spring levels: Burro - in the valley below the southeastern edge of the mesa, a spring near Dennehotso - below the northeastern edge of the mesa, Moenkopi - beyond the southwestern edge of the mesa and Pasture Canyon - beyond the western edge of the mesa. The anecdotal evidence that the precious Hopi and Navajo springs are drying up is all that is available.

²⁶ A Three-Dimensional Flow Model of the D & N Aquifers. Black Mesa Basin, Arizona, September 1999, page 6-21.

²⁷ The USGS 2-D model shows the wells in this area going dry in 2023.

²⁸ Tuba City is where the Commission held its Prehearing Conference for this proceeding.

The estimated impact of continued ground water pumping for coal mine use in the confined area of the aquifer is just as disturbing:

Drawdowns reach about 450 ft (higher at individual PWCC wells) near the leasehold as a result of PWCC pumping, though about 35 ft of this drawdown by 2054 is due to tribal community pumping. (pg. 6-20) (Note PWCC = Peabody Western Coal Company, drawdown is a euphemism for drops in the water levels of the wells).

It is little wonder that the residents in this desert region are so opposed to continued ground water pumping to supply the coal slurry pipeline. For them this is not an abstract discussion of economics and models. For them this is a direct and real threat, not only to their current way of life, but to their very existence.

V.2 Is This Use of Water Consistent with California Water Policy?

The highest quality water in this desert, N-aquifer water, is used to transport coal to Nevada. About half of the water used in the slurry pipeline is reused as cooling water in the power plant. The rest is allowed to evaporate. This use of water would be extremely difficult to permit in California.

Some history on allowable power plant water use in California is illustrative. On June 19, 1975, amid concerns about the diminishing availability of fresh water in California, the State Water Resources Control Board (SWRCB) adopted its “Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Powerplant Cooling” (Resolution No.75-58)²⁹. The Resolution provides statewide water quality principles and guidance for the adoption of discharge requirements, as well as implementation actions for power plants that depend upon inland waters for cooling. Inland waters are defined as all waters within the territorial limits of California exclusive of the waters of the Pacific Ocean outside of enclosed bays, estuaries, and coastal lagoons. Fresh inland waters include inland waters (both surface water and ground

²⁹ www.swrcb.ca.gov/plnspols/wqplans/pwrplant.doc

water) suitable for use as sources of domestic, municipal, or agricultural water supplies or that provide habitat for fish and wildlife.

Resolution 75-58 states that from a water quantity and quality standpoint, the source of power plant cooling water should come from the following sources (in order of priority): 1) wastewater being discharged to the ocean; (2) ocean water; (3) brackish water or natural sources of irrigation return flow; (4) inland wastewaters³⁰ of low total dissolved solids (TDS); and (5) other inland waters. Where the SWRCB has jurisdiction, use of fresh inland waters for power plant cooling will be approved by the Board only when it is demonstrated that the use of other water supply sources or other methods of cooling would be environmentally undesirable or economically unsound. The Board will consider the reasonableness of the proposed water use when compared with other present and future needs for the water source, and when viewed in the context of alternative water sources that could be used for other beneficial purposes.

Additionally, California Water Code Section 13550 et seq. requires the use of effluent for industrial purposes, especially for cooling, where it is available. Furthermore, the SWRCB encourages the use of wastewater for power plant cooling.

In 1997, the siting agency in the state, the California Energy Commission (CEC), and the SWRCB entered into a Memorandum of Understanding in order to coordinate the review of projects for which a regional water quality control board or the SWRCB have authority. The CEC implements SWRCB Policy 75-58 by evaluating proposed power plant water use in the following order of priority:

1. Wastewater being discharged to the ocean;
2. Ocean water;
3. Brackish water from natural sources or irrigation returns flow;
4. Inland wastewaters of low total dissolved solids; and
5. Other inland waters.

If there are no alternatives to the use of inland waters, the California Energy Commission staff continues its analysis of SWRCB Policy 75-58 by considering the alternatives of dry and

³⁰ Also called reclaimed water or effluent.

combination wet/dry cooling³¹. If the SWRCB policy is applicable, use of fresh inland waters for power plant cooling will be approved only when it is demonstrated that the use of other methods of cooling are environmentally undesirable or economically unsound.

The following table provides a summary of power plants approved by the CEC and either operating or under construction as of January 2003. Very few power plants have been allowed to use fresh water in California, and such use is approved only if there are no other viable alternatives.

³¹ Wet Cooling – Wet cooling is the developer technology of choice in California, given that once-through cooling is no longer available. In wet cooling, cooling towers reject heat from the steam by evaporating water. A conventional 500 MW thermal combined cycle gas-fired power plant using the preferred technology (wet cooling) in California may consume from 2,000 to 4,000 acre-feet of water per year. The majority of this water, 80 to 90 percent, is used in the closed loop cooling system utilizing wet cooling technology. Dry Cooling. Dry cooling rejects heat via convection through heat exchangers (essentially big radiators). While dry cooling can reduce a projects water use by up to 90% (consumptive water use is in the 200-400 acre-ft per year range) the dry cooling systems are much more complicated to construct, 2-3 times more expensive to construct, and considerably more expensive to operate, due to the energy requirements to run the pumps and fans. Dry cooling also reduces the effective generating capacity of the power plant, using up to 10 percent of the plant's electricity just to operate the cooling system.

Table 5-2

POWER PLANT PROJECTS BY ENERGY COMMISSION CURRENTLY ON LINE
(As of January 16, 2003)

**PROJECTS GREATER THAN 300 MW
CURRENTLY ON LINE**

Project	Applicant / Host	Size (megawatts)	Capital Cost	Location	Cooling Water	Construction Start Date And Percent Completed [4]	Estimated On Line
Huntington Beach Modernization (00-AFC-13)	AES	225 MW ----- Another 225 MW On Hold	\$130 million	Huntington Beach Orange County	Saline	May 31, 2001 225 MW Unit 3 - ON LINE 225 MW Unit 4: 99% complete	225 MW Unit 3 ON LINE 7/31/02 225 MW Unit 4 On Hold
Moss Landing (99-AFC-4)	Duke Energy	1,060 MW	\$475 million	Moss Landing, Monterey County	Saline	November 28, 2000 100% complete	530 MW Unit 1 - ON LINE July 1, 2002 ----- 530 MW Unit 2 - ON LINE July 11, 2002
Sunrise Phase I (98-AFC-4)	Edison Mission Energy and Texaco Global Gas & Power	320 MW	\$175-195 million	Fellows, Kern County	Potable – steam used in oil fields	December 2000 100% complete	ON LINE June 27, 2001
Sutter Power (97-AFC-2)	Calpine	540 MW	\$250-285 million	Yuba City area, Sutter County	Dry cooling	July 1999 100% complete	ON LINE July 2, 2001
Los Medanos Energy Center (Formerly known as Pittsburg District Energy Facility) (98-AFC-1)	Calpine	555 MW	\$300 million	Pittsburg, Contra Costa County	Reclaimed	September 17, 1999 100% complete	ON LINE July 9, 2001
Delta Energy Center (98-AFC-3)	Calpine and Bechtel	887 MW	\$350-450 million	Pittsburg, Contra Costa	Reclaimed	April 2000 100% complete	ON LINE June 17, 2002

POWER PLANT PROJECTS APPROVED BY ENERGY COMMISSION

UNDER CONSTRUCTION

As of January 16, 2003

PROJECTS GREATER THAN 300 MW UNDER CONSTRUCTION

Project	Applicant / Host	Size (megawatts)	Capital Cost	Location	Cooling Water	Construction Start Date And Percent Completed [4]	Estimated On Line
Blythe Energy (99-AFC-8)	Blythe Energy LLC	520 MW	\$250 million	Blythe, Riverside County	Brackish-groundwater	April 27, 2001 98% complete	March 2003
Contra Costa Repower (00-AFC-1)	Mirant	530 MW	\$200-\$300 million	Antioch, Contra Costa County	Reuse existing water rights	August 30, 2001 7% Complete CONSTRUCTION ON HOLD	June 2005
Elk Hills (99-AFC-1)	Sempra/OXY	500 MW	\$300 million	Elk Hills, Kern County	Groundwater	June 8, 2001 85% complete	June 2003
High Desert (97-AFC-1)	Inland Group and Constellation Energy	720 MW	\$350+ million	Victorville, San Bernardino County	Groundwater	May 1, 2001 90% complete	July 2003
La Paloma (98-AFC-2)	PG&E National Energy Group	1,124 MW	\$500 million	McKittrick area Kern County	Surface water	January 1, 2000 99% complete	Units 1 & 3 On Line 1/10/03 Units 2 & 4 On Line 2/03
Metcalf Energy Center (99-AFC-3)	Calpine and Bechtel	600 MW	\$300-400 million	San Jose, Santa Clara County	Reclaimed	1/15/2002 3% complete	December 2004
(Western) Midway-Sunset (99-AFC-9)	ARCO Western Energy Company	500 MW	\$250 million	McKittrick, Kern County	Use reclaimed to replace potable water on site	March 2003 0% complete CONSTRUCTION ON HOLD	March 2006
Mountainview (00-AFC-2)	Thermo Ecotek	1,056 MW	\$550 million	San Bernardino County	Reclaimed	September 11, 2001 15% Complete CONSTRUCTION ON HOLD	June 2004 ON HOLD

Otay Mesa (99-AFC-5)	Otay Mesa Generating Company, LLC (Calpine Corporation)	510 MW	\$350 million	Otay Mesa area, San Diego County	Dry cooling	September 10, 2001 5% Complete	December 2004
Pastoria (99-AFC-7)	Enron	750 MW	\$350- 450 million	Tejon Ranch, Kern County	Surface water	October 3, 2001 41% complete	June 2004
Russell City Energy Center (01-AFC-7)	Calpine/Bechtel Inc.	600 MW	\$300- 400 million	Hayward Alameda County	Reclaimed	CONSTRUCTION ON HOLD	June 2005
Three Mountain Power (99-AFC-2)	Ogden Pacific Power	500 MW	\$300 million	Burney, Shasta County	Hybrid wet/dry	Spring 2004 0% Complete CONSTRUCTION ON HOLD	March 2006
12 plants	TOTAL MW	7,910 MW					

V.3 Alternative Sources of Water for the Coal Slurry Pipeline

The alternatives that have been or are being investigated, such as the Lake Powell pipeline, the “pump back” option, or even the “I-40” option using C-aquifer water, all still use fresh water to run a coal slurry pipeline in the desert, a use that probably would not be allowed if the operation were located in California³². In addition to their economic questionability, these alternatives wander into the Colorado River water rights morass that has occupied many attorneys for many years and shows no indication of coming to resolution any time soon. A point of illustration is the current fight over reductions in Colorado River water to California (the Imperial debate).

If this facility were in California, and the California Energy Commission were the licensing agency, we’d be looking at two alternatives—the use of reclaimed water and the use of

³² California also uses reclaimed wastewater at The Geysers Geothermal Field in Northern California to produce electricity.

dry cooling in the power plant to reduce its water consumption at the power plant so that water already obtained under existing water rights could be used for the slurry pipeline³³.

V.3.a Reclaimed Water

The following table (Table 5-3) shows major sources of municipal reclaimed water in the area, and the approximate pipeline-miles to Black Mesa³⁴. Reclaimed water has many of the same chemical characteristics as the potable water it was derived from (such as TDS, pH, etc.) and should be directly useable in the pipeline without additional treatment. There is a sufficient volume of reclaimed water in the area that is of comparable pipeline quality, particularly if the pipeline can shift from its current 50/50 coal/water mixture to the proposed 70/30 coal/water mixture:

” Black Mesa may yet benefit from a novel coal slurry pipeline system being tested in the US and Europe. Rather than the usual 50/50 ratio of coal and water used in present slurries, this system uses a 70/30 ratio, creating a combustible slurry which can act as a fuel without further treatment. The possible advantages being that the system would lower grinding and dewatering costs for a mine, and may even reduce corrosion in the pipes, without the need for an oxygen inhibitor, as is the current practice. From an environmental point of view, the fact that it can use coal fines in the slurry, thereby alleviating one of the problem by products of coal mining, is an enormous benefit (see Energy from Coal Waste, WME Jan/Feb 2002).”³⁵

³³ The use of brackish or saline water is also an option that could be investigated but due to the time constraints in this proceeding we are not addressing it.

³⁴ For comparison, the Lake Powel alternative requires approximately a 50 mile pipeline, and the I-40 C-Aquifer option requires approximately a 90 mile pipeline.

³⁵ “Moving Mountains”, Jonathan Watt, World Mining Equipment, May 2002, www.wme.com

Table 5-3. Reclaimed Water Availability

<u>CITY</u>	<u>STATE</u>	<u>ACRE-FT AVAILABLE</u>	<u>PRICE \$/ AC- FT</u>	<u>MILES TO BLACK MESA</u>	<u>CONTACT ORGANIZATION</u>
Gallup	NM	3,285	\$165	125	City of Gallup
Flagstaff	AZ	6,750	\$325	100	City of Flagstaff
Farmington	NM	5,800	n/a(1)	150	City of Farmington
Las Vegas	NV	100-200,000	n/a(1)	375 (90 to Laughlin)	Southern Nevada Water Authority

Notes:

(1) must stay in watershed for return water rights credit.

We believe that the use of Gallup reclaimed water for the pipeline could be implemented by 2006. With the exception of crossing a couple highways, the entire pipeline would be on Navajo land. The Tribe would be the permitting agency and many of the problems and delays associated with crossing private, state and federal land would be minimized.

V.3.b Conserved Water

The whole reason we are having this proceeding is because it was deemed that 40 year old air pollution technology at Mohave was inadequate for the 21st century. What about the water technology? Mohave was built in the 1960s, in an era when there were many fewer demands on the Colorado River than there are today, and will be in the future. It does not incorporate current water conservation technologies. To allow Mohave to continue to waste water in necessary cooling will exacerbate the critical water shortages in Arizona, California, Nevada, and Mexico.

Mohave could easily reduce its cooling water requirements, via either a dry cooling system or a hybrid wet/dry cooling system³⁶. The following table shows the potential impacts of utilizing alternative cooling technology. A solution that conserves even more water would be

³⁶ Although at an increased capital and operating cost.

to switch to another type of coal generation technology – the integrated gasification combined cycle technology (see Chapter 7):

Table 5-4. Water Consumption By Generation Technology

Current Mohave fresh water use	25,000-30,000 acre-ft/year
Conventional dry-cooled boiler (1500 MW)	3,000 acre-ft/year
Integrated gasification combined cycle with zero liquid discharge	120 acre-ft /year

These options would free up water that had previously been used for just for cooling purposes and that water could be shipped back to Black Mesa for use in a coal slurry pipeline, using the existing pipeline right-of-way. This solution would have the further benefit of allowing additional water that had previously been used by MGS for power plant cooling to be shifted to alternative uses, such as additional water for Nevada usage, or additional water that could be sent downstream for California and Arizona, or Mexico, to use.

Enough water could be saved by going to dry cooling at Mohave to supply the water needs of approximately 50,000 average California homes. That water is going to become increasingly valuable in the future. The California Water Code requires the State Department to publish an update of the California Water Plan every five years. Bulletin 160-98 is the latest in a series of water plan updates³⁷. The Bulletin 160 series evaluates water supplies and assesses agricultural, urban, and environmental water uses to quantify the gap between water supplies and uses. The main focus of Bulletin 160-98 was to evaluate options for meeting the State's future water needs. It shows that California runs a net deficit of 1.6 million acre-ft/year in a normal water year and a deficit of 5.1 million acre-ft in a dry year³⁸ and that deficit is projected to grow in the future, despite aggressive water conservation plans. The reason California has not experienced water shortages is that we have been in an unprecedented string of eight wet years in a row. However, this Commission should consider if using water for human consumption will

³⁷ Another Bulletin 160 is expected to be released in 2003.

³⁸ Bulletin 160-98, State Water Plan, Department of Water Resources, Table ES5-1.

be more valuable in the 21st century than using that water for power plant cooling, especially when there are demonstrated technologies available today to reduce water use for the latter purpose.

In this proceeding Edison was initially asking for permission to put pollution controls on a power plant that evaporates 25,000 acre-ft per year unnecessarily into the desert air, at a time when California has lost 800,000 acre-ft of water from the Colorado River due to the collapse of the Imperial-San Diego deal, when the Colorado basin experienced its lowest runoff in over a century, and when Lake Powell is at its lowest level since it was being filled in 1971.

V.4 Water Summary

In summary: continued N-aquifer groundwater pumping for the coal slurry is not a viable option, but there are reclaimed water solutions that would: (1) eliminate the need for groundwater pumping on Black Mesa; (2) provide water of a sufficient quality and quantity for a coal slurry pipeline; (3) improve the utilization of fresh water resources in the Southwest; (4) not impact current water rights or water rights litigation; and (5) improve the economies of the local entities that would provide reclaimed or reused water, all at a pipeline cost that is comparable to the fresh water alternatives being evaluated. There are still implementation issues (such as right-of-ways, potential environmental impact statements, construction, and others) that could be solved by 2006, if the parties involved would forget past wrongs and injustices, and work toward developing a solution to the problem.

There is also a dry cooling option that: (1) has already been voluntarily accepted by several mine-mouth coal plants in the Southwest³⁹; (2) would free up tens of thousands of acre-ft of clean water that could be used for other uses; (3) could be implemented without new rights-of-way by paralleling the existing slurry pipeline; and (4) would not impact current water rights or water rights litigation. It seems ill-advised to approve modifications to a generating plant that

³⁹ Pers. Communication with Bill Powers, Powers Engineering, 2/21/2003.

allows 25,000 acre-ft of water to simply evaporate into the desert air, particularly when there are demonstrated technologies available today to reduce that water use.

Lastly, there are generation alternatives (Integrated Generation Combined Cycle) that could use the coal on Black Mesa to produce electricity at a comparable cost to direct fired coal but are orders of magnitude cleaner (even compared with the proposed pollution control modifications to Mohave), more efficient, and waste almost no water (see Chapter 7).

Unfortunately, we have reluctantly to conclude that the prospect of resolving the water issues – even when feasible alternative sources have been identified — and getting an alternative water supply for the pipeline implemented by 2005 to continue operation of Mohave is problematic. This Commission should pursue a course that evaluates the transition that will occur if Mohave is to be shut down in 2006.

VI. ECONOMIC IMPACTS OF MINE SHUTDOWN

The operation of Black Mesa Mine is fundamental to the economic wellbeing of the area. Peabody is the only significant employer in the area, interjecting some \$83 million per year directly into the local economy, as the following table illustrates.

Table 6-1. Annual Direct Economic Impact of Black Mesa Mine⁴⁰

BLACK MESA MINE	
Wages & Fringes	\$18,800,000
Royalties	17,700,000
Vendors	24,000,000
Taxes	14,200,000
Contributions	<u>175,000</u>
Total	\$ 74.9 million

BLACK MESA PIPELINE	
Wages & Fringes	\$2,700,000
Vendors	5,300,000
Taxes	225,000
Leases	8,000
Contributions	<u>8,000</u>
Total	\$ 8.2 million

In addition to the direct economic benefits, there are indirect economic benefits to the local economy⁴¹. It has been estimated that the indirect economics benefits from the mine and pipeline are over \$45 million per year⁴². The closing of the Black Mesa mine will result in a loss of over \$125 million per year to the local economy of this impoverished region.

⁴⁰ Response by Peabody to WEC data request, 3/07/2003.

⁴¹ Indirect economic benefits are the secondary spending of the businesses that supply goods and services to the mine and the spending of the income by individuals of mine related wages and salaries.

⁴² "Contributions of the Mohave Generating Station to Local Economies", Robert Fletcher and George Borden, Final Report, March 4, 2002, Tables 6 and 7.

The Hopi and Navajo Tribe receive over \$32 million per year in coal and water royalties, and in taxes, composing over 80 percent of the total Hopi Tribe budget and almost 30 percent of the Navajo budget.

Unfortunately, due to the lack of cooperation of the Hopi Tribe and Navajo Tribe in this proceeding in responding to discovery, we are unable to determine how the Tribes are spending this money, and what contingencies the Tribes have made for the cessation of this income in 2006.

As we stated in the last chapter, we are not optimistic that the quarrelling parties will be able to resolve the slurry water issue in sufficient time to avert a shutdown of Mohave in 2006. As our analysis shows in the following chapter, we believe that even if the water issues are solved, the money proposed for the pollution retrofits on Mohave would be better spent on clean coal technologies, generation that will not require shipping the coal to Nevada to be used.

Regardless of what happens, it appears that there will be a minimum of several years starting in 2006 when the Black Mesa Mine will not be providing coal. The Commission needs to open another phase to this proceeding to address the severe economic dislocation that will occur when the Black Mesa Mine shuts down in 2006.

VII. ALTERNATIVES TO MOHAVE

Indian reservations are not known for their high standard of living. But even within this economically disadvantaged segment of American society, the Navajo and Hopi Reservations have a dubious distinction—they have the highest proportion of households lacking electricity and running water among all of the reservations in the United States. This is especially ironic as coal and water from these reservations powers thousands of megawatts of electricity generation⁴³ that power the thriving metropolises of the Southwest.

The estimated \$2 billion in tribal revenues over the last 30 years⁴⁴ from coal mining and groundwater pumping have been put to good use on the reservations, funding everything from schools to health services to infrastructure development. However, there is still a huge amount of work to do. While the goal of the Navajo Tribal Utility Authority (NTUA) is modest by any other contemporary American standard— “We want to put an electrical outlet and two light bulbs in every hogan on the Navajo Reservation.”⁴⁵—it is still far from being realized, particularly in the area of the strip mines, the Big Mountain area of Black Mesa.

And in this proceeding before the California Public Utilities Commission we are discussing shutting down the Mohave Generating Station, which will result in the closing of the Black Mesa Mine, the loss of many of the few good paying jobs on the reservations, and the devastation of the tribes’ incomes. It is estimated that 80% of the Hopi budget and over one-third of the Navajo annual budget would be in jeopardy if the Black Mesa Mine closes.

Alternatives to retrofitting or closing Mohave should be addressed in this proceeding for two reasons. First, the economic consequences on the local population associated with the potential closing of Mohave in 2006 could be alleviated if other energy generation alternatives were developed. Second, even in the default case, alternative generation possibilities should be investigated before the CPUC approves the estimated \$1.2 billion in retrofits Edison has

⁴³ Four Corners, Navajo, and Mohave Generating Stations.

⁴⁴ Press Release, Peabody Coal, January 22, 2003.

proposed. Edison basically has the equivalent of a 1968 Chevy pickup in Mohave. They are proposing bringing this 30-year-old technology into the 21st century by the equivalent of adding a catalytic converter to the old Chevy. Before the Commission approves any investment for the next 30 years, it should take a serious look at what technological alternatives are available.

Black Mesa has a lot of coal⁴⁶, and that coal has a long history of use by humans. It is estimated that between 1300 and 1600 A.D. local Indians removed over 100,000 tons of coal from Black Mesa for purposes such as cooking, firing pottery, and heating⁴⁷. Black Mesa is the only source of coal production in Arizona and an estimated 220 million short tons⁴⁸ of coal remain.

Absent the use of coal, a resource assessment reveals there are few available energy resources for the Black Mesa area⁴⁹. It has no geothermal resources, no consistent wind source⁵⁰, insufficient biomass, and no hydroelectric potential. Nor are there any industries in the area for cogeneration. The mesa does have a good solar resource, with annual average solar insolation between 6.1-6.6 kWh/m²/day⁵¹. This solar resource has already been put to use in a limited way. Since 1985, the Hopi Foundation has operated an enterprise called NativeSun, which installs photovoltaic panels on residences on the Hopi Reservation⁵². The cost of a photovoltaic system is less than the cost of extending the electric grid (estimated at \$40,000 per linear mile). Some 450 residences have been equipped with photovoltaic panels under this program.

Continued from the previous page

⁴⁵ NTUA: 'A Light in Every Hogan,' The Navajo Times, September 5, 1962, quoted in "Rural Electrification in Arizona" by Leah S. Glaser, available at www.emecc.org.

⁴⁶ Geologic Assessment of Coal in the Colorado Plateau: Arizona, Colorado, New Mexico, and Utah, Edited by M.A. Kirschbaum, L.N.R. Roberts, and L.R.H. Biewick, U.S. Geological Survey Professional Paper 1625-B.

⁴⁷ www.osmre.gov/navajotribe.pdf.

⁴⁸ Coal Data: A Reference, U.S. Energy Information Agency, February 1995.

⁴⁹ Energy Consumption and Renewable Energy Development Potential on Indian Lands, Energy Information Administration, April 2000.

⁵⁰ Although there has been identified an excellent wind resource to the east of Black Mesa on the Navajo Reservation on the west side of the Chuska Mountains that has not been developed. This area has been ranked as a "superb" wind resource area, with power densities of 800-1600 W/square meter and wind speeds of 19.7-24.8 mph.

⁵¹ Arizona Renewable Energy Resources, available at www.energyatlas.org.

⁵² www.nativesun.biz.

VII.1 Generation Alternatives

Table 7-1 compares the characteristics of generating resources⁵³ that could be available on the mesa to generation to using the current technology of choice – natural gas fired generation.

Table 7-1. Generation Technology Characteristics

Type	Generation	2001 Instant Installed \$/kW	Heatrate btu/kWh	fixed O&M 2001\$/kW-yr	variable O&M		Source
					mills/kWh		
Peaking	Photovoltaics	\$3,915	0	10.06	0		Table 40, Annual Energy Outlook 2003
	Solar Thermal	\$2,594	0	48.91	0		Table 40, Annual Energy Outlook 2003
	Pumped Storage	\$744	75%	20.00	3.25		Energy Storage Partners
	Combustion Turbine	\$409	10,939	10.22	4.09		Table 40, Annual Energy Outlook 2003
Baseload	Conventional coal Integrated	\$1,154	9,000	24.52	3.07		Table 40, Annual Energy Outlook 2003
	gasification CC	\$1,367	8,000	33.72	2.04		Table 40, Annual Energy Outlook 2003
	Nat Gas CC	\$536	7500	12.26	2.04		Table 40, Annual Energy Outlook 2003

The peaking resources are generation that is available during electrical high demands (the daytime). The mesa has a good solar regime, thus photovoltaic and solar thermal generation are included. The north edge of Black Mesa is an attractive candidate for a pumped storage facility⁵⁴. It has a vertical displacement of approximately 2,000 feet, and there is adequate undeveloped land at the base and on top of the mesa for the reservoirs.

The range of base load fossil fuel generation technologies are: 1) conventional pulverized coal steam generator, 2) fluidized bed coal-fired steam generator, 3) integrated

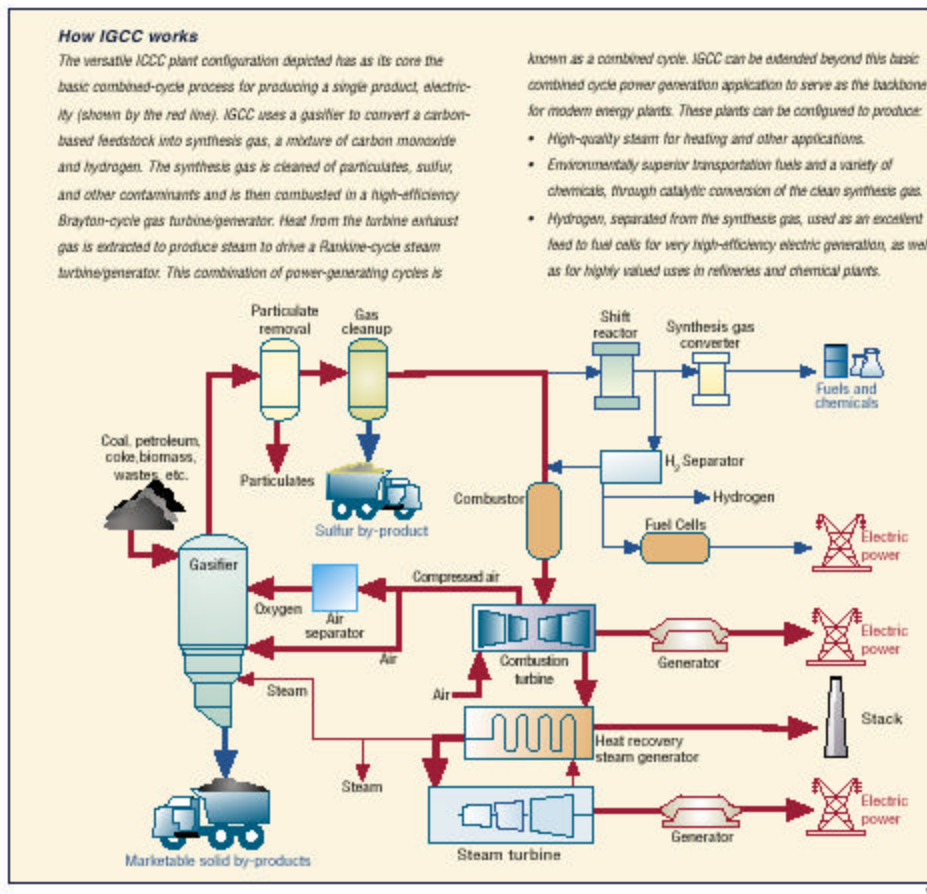
⁵³ Using the EIA/DOE “Annual Energy Outlook 2003” generation characteristic assumptions.

⁵⁴ Pumped storage facilities utilize reversible hydroelectric turbine generators to pump water from a lower reservoir to an upper reservoir when electricity prices are low, and reverse direction to generate electricity when electricity prices are high or for reliability purposes.

gasification combined cycle plant⁵⁵, which gasifies the coal and uses the combustible gases produced in the gasifier to generate power in a combined-cycle gas turbine power plant, and finally 4) a natural gas-fired combined cycle power plant. The natural gas combustion turbine can also be configured as a stand alone, simple cycle combustion turbine for peaking applications or a combined-cycle configuration for base load power production.

Concern for environmental issues has generated increasing interest in new technologies for coal utilization that offer increased efficiency with reduced emissions. Coal gasification is a well-established technology for the production of pipeline gas or synthesis gas for chemical production. The following figure illustrates how coal gasification works⁵⁶.

Figure 7.1. Integrated Gasification Combined Cycle (IGCC) Diagram



⁵⁵ Where the coal is gasified and then used to fire a combined cycle facility.

⁵⁶ "Integrated Gasification Combined Cycle", US DOE, Federal Energy Technology Office, July 1999.

Coal gasification has been used for over 40 years in the chemical industry to produce feedstocks – the raw ingredients for making plastics, fertilizer, antifreeze, and fabrics. Coal gasification can also produce hydrogen for use in the hydrogen economy of the future. Over 8,000 MW of coal gasification is either currently operational or is being constructed, as the following figure shows.

Figure 7.2. IGCC Generation

<u>Customer</u>	<u>C.O. Date</u>	<u>MW</u>	<u>Application</u>	<u>Gasifier</u>
SCE Cool Water - USA	1984	120	Power/Coal	Texaco - O ₂
LGTI - USA	1987	160	Cogen/Coal	Destec - O ₂
Demkolec - Netherlands	1994	250	Power/Coal	Shell - O ₂
PSI/Destec - USA	1995	260	Repower/Coal	Destec - O ₂
Tampa Electric - USA	1996	260	Power/Coal	Texaco - O ₂
Texaco El Dorado - USA	1996	40	Cogen/Pet Coke	Texaco - O ₂
SUV - Czech.	1996	350	Cogen/Coal	ZUV - O ₂
Schwarze Pumpe - Germany	1996	40	Power/Methanol/Lignite	Noell - O ₂
Shell Pernis - Netherlands	1997	120	Cogen/H ₂ /Oil	Shell - O ₂
Puertollano - Spain	1998	320	Power/Coal/Pet Coke	Prenflow - O ₂
Sierra Pacific - USA	1998	100	Power/Coal	KRW - Air
ISAB - Italy	1999	500	Power/H ₂ /Oil	Texaco - O ₂
API - Italy	2000	250	Power/H ₂ /Oil	Texaco - O ₂
MOTIVA - Delaware	2000	240	Repower/Pet Coke	Texaco - O ₂
Sarlux/Enron - Italy	2000	550	Cogen/H ₂ /Oil	Texaco - O ₂
EXXON – Singapore	2000	180	Cogen/H ₂ /Oil	Texaco - O ₂
Nihon Sekiyu - Japan	2004	350	Power/Oil	Texaco - O ₂
Bio Electrica – Italy	2005	12	Power/Biomass	Lurgi – Air
ENI-San Nazzaro, Italy	2005	150	Power/Oil Cogen	Shell
IOC Paradip	2005	180	Power/Pet Coke	Shell O ₂
Global-Kylkima, OH	2006	1000	Power/Coal/RDF	BGL - O ₂
EDF - Total	2006	400	Power/H ₂ /Cogen/Oil	Texaco - O ₂
Texaco/TVA	2006	800	Power/Coal	Texaco - O ₂
PIEMSA	2006	800	Power/H ₂ /Oil	Texaco - O ₂
TPS/Lake Charles	2006	<u>1000</u>	Power/H ₂ /Oil	Texaco - O ₂
		<u>8432</u>		

• Projects in operation, under construction or announced
• Bold: GE Gas Turbines

Source: Calpine Fuels Diversity Initiative: Integrated Gasification Integrated Gasification Combined Cycle Power Plants.

The first utility-scale IGCC project in the U.S., PSI’s Wabash, Indiana 250 MW IGCC power plant, has been operational since 1995. Tampa Electric’s Polk Power Station Unit 1, a 250-megawatt IGCC facility, began commercial operation in the fall of 1996 and has also performed well. The U.S. Department of Energy (DOE) has been instrumental in commercializing IGCC over the last 10 years. Both of the PSI and Tampa Electric projects received some grant funding from the DOE. Nordic Energy is currently proposing an 800 MW IGCC plant near Ashtabula, Ohio. Nordic estimates the cost of the project at \$1.2 billion and is seeking \$150 million in DOE grant support. Southern Company Services, with the participation

of Peabody Coal Company, is planning to site a 300 MW IGCC plant in either Illinois, New Mexico, or Alabama if an appropriate mix of private financing and DOE grant funding can be obtained.⁵⁷

Shell also manufactures an IGCC gasifier that uses very little water, unlike most U.S. designs. This development is significant for a possible power plant installation on Black Mesa, where absolute minimum water demand is a top priority. Use of a Shell gasifier combined with dry cooling would minimize the water demand of an IGCC plant⁵⁸.

Table 7-2 compares the relative cost of electricity from the generation technologies discussed above⁵⁹. The “MW at \$1.2B” shows the equivalent amount of capacity of the various technologies that could be installed using the \$1.2 billion that Edison was proposing to spend on Mohave retrofits. The “GWH” is the expected number of gigawatthours that could be generated by that installed capacity. The “level cents/kWh” is the levelized cost of electricity from these technologies, assuming a 2006 start date, a 30-year life, and the California Energy Commission’s projections on natural gas costs⁶⁰. Since power plant dispatch is generally conducted based upon incremental costs, a “dispatch cents/kWh” column that represents the levelized fuel costs has been included in the table.

⁵⁷ DOE summary, “Recent Clean Coal Technology Initiatives,” December 2002.
http://www.naruc.org/programs/cct/cct_initiatives.pdf

⁵⁸ It is important to note that DOE has not participated in IGCC projects that use a Shell gasifier.

⁵⁹ It should be noted that these costs do not include any tax credits or pollution credits, nor do they assume that at \$8 billion in clean coal incentives announced by the Bush Administration are used for any of the technologies.

⁶⁰ “Natural Gas Supply and Infrastructure Assessment”, California Energy Commission, #700-02-006F, December, 2002. Southern Nevada gas price for electrical generation, Table D-3. Note that the start price for natural gas was assumed to be \$3.45/mmbtu. Prices in February 2003 were in the \$8-10/mmbtu range, and now (early March) are in the \$6-8/mmbtu range. The Energy Commission, in its “Comparative Cost of California Central Station Electric Generation Technologies” (100-03-001SD, Feb 11, 2003) provides assumptions on the cost and characteristics of natural gas-fired combustion turbines and combined cycles. The main differences between the Energy Commission’s (CEC) assumptions and the DOE assumptions used here are: the CEC assumes lower heatrates – 9,300 versus 10,939 btu/kWh for the DOE assumption on the CT, and 6,800 versus 7,500 btu/kWh for the DoE assumptions for the NGCC. The CTC also assumes different capacity factors – 9% for the CT versus 25% used here, and 92% for the NGCC versus 80% used here.

Table 7-2. Levelized Cost of Electricity

Type	Generation	MW at \$1.2B	GWh	Level ¢/kWh	Dispatch ¢/kWh
Peaking 30% CF	Photovoltaics	307	671	25.9	0
	Solar Thermal	463	1,013	20.0	0
	Pumped Storage	1,613	3,532	12.2	4.7
	CT	2,934	6,425	10.6	6.3
Baseload 80% CF	Conventional coal	1,040	2,277	4.9	1.5
	IGCC	878	1,922	5.5	1.3
	NG CC	2,239	4,903	6.1	4.3

Assumptions:

Fuel	2002 start price \$/mmbtu	annual escalation
Natural Gas	\$3.45	1.9% real/year
<i>Source:</i> Natural Gas Supply and Infrastructure Assessment, California Energy Commission, #700-02-006F, December, 2002. Southern Nevada gas price for electrical generation, Table D-3.		
Coal	\$1.29	-.05% real/year
<i>Source:</i> Edison FERC Form 1, pg. 402 EIA/DOE, Annual Energy Outlook 2003, pg. 86		
Assuming Pumped Storage pumped with off peak energy at 2.8 cents/kWh, escalating at 1% real/year.		
All Plants: 30 year life, 2006 start date, utility owned generation, 20 year loan		

For peaking technologies⁶¹, a natural gas-fired, simple cycle combustion turbine provides the greatest amount of electricity at the least cost, but it has the highest variable operating costs.

For base load technologies⁶², coal is currently a cheaper fuel than natural gas, and that spread is anticipated to widen in the future⁶³. A conventional coal plant produces the lowest priced electricity, almost 20 percent cheaper than natural gas, but the integrated gasification combined cycle power plant has the lowest dispatch cost. Both coal generation types are cheaper

⁶¹ For consistency's sake, a 25% annual capacity factor was used.

⁶² For consistency's sake, an 80% annual capacity factor was used.

⁶³ The California Energy Commission forecasts natural gas prices escalating at 2 percent per year above the rate of inflation.

Continued on the next page

than the natural gas-fired combined cycle power plant on a levelized basis and both have less than one-half the dispatch cost of the gas-fired combined cycle option.

These results are consistent with what other studies have found. The Electric Power Research Institute found natural gas combined cycles the most economical up to a gas price of \$3.91/mmbtu⁶⁴, a price we haven't seen since the fall of 2002. Beyond that natural gas price, both direct-fired coal and IGCC were more economical producers of electricity.

VII.2 Environmental Impact

On the environmental side, IGCC is orders of magnitude cleaner than direct coal fired generation and uses several orders of magnitude less water (see Chapter 5):

“IGCC is inherently less polluting and more efficient than any other coal power generation technology. In IGCC, harmful pollutants are removed from the syngas before they reach the gas turbine; therefore, end-of-pipe/ stack cleanup is not necessary. IGCC efficiently removes ash, sulfur compounds, ammonia, mercury, other metals, and any particulate matter to reduce air pollution. Emissions of SO_x, NO_x, mercury, heavy metals, and particulate from an IGCC plant are fractions of the emissions from conventional, coal power plants.”⁶⁵

Table 7-3 compares the relative emission rates from a natural gas-fired combined cycle facility (NGCC), a coal Integrated Gasification Combined Cycle facility (IGCC), and a direct fired coal generation facility (like Mohave) with selective catalytic reduction (SCR), wet scrubbers for sulfur emissions, and baghouse filters for particulate emissions. IGCC is orders of magnitude cleaner than direct fired coal generation, even when the direct coal fired generation has extensive pollution controls, and is close to natural gas-fired generation in most emission categories.

Continued from the previous page

⁶⁴ A summary is available at www.epriccenter.infocenter/new_project/gen_planning/coal/FAQ.php3

⁶⁵ The IGCC Process: From Coal To Clean Electric Power, Testimony of Edward Lowe Subcommittee on Clean Air, Wetlands and Climate Change Hearing on Compliance Options for Electric Power Generators January 29, 2002

Table 7-3. Emission Comparisons: NGCC, IGCC, Direct Fired Coal

<u>Emission</u>	<u>NGCC</u>	<u>IGCC</u>	<u>Direct-fire Coal</u> <i>w/SCR, wet scrubber, baghouse filter</i>
SO2	0	.03lb/mmbtu	2.5x
NOx	3ppm	1-1.5x	2.5-7.0x
CO2	400g/kWh	1.5-2.5x	2.5-3.0x
particulates	trace	.088lb/Mwh	10x

References

- 1) "Clean Coal Technology Evaluation Guide"
Ron England, 25th International Technical Conference on Coal Utilization and Fuel Systems
- 2) "Carbon Sequestration Using Texaco Gasification Process", Jeff Seabright, 1st National Conference on Carbon Sequestration, May 16, 2001.
- 3) "Electricity Generation and Technology Alternatives to Fossil Fuels", Mary Griffith, Terratama, May 27-29, 2002
- 4) "Integrated Gasification Combined Cycle", Norm Shilling, 2002 Power Generation Conference.
- 5) "Advantage of Integrated Coal Gasification Combined Cycle Over Other Advanced Generation Technologies and its Prospect in a Competitive Marketplace", Manoj K. Guha, American Electric Power Service Corporation

Note: expressed in terms of percentage of base value:1x=100% of base value.

As the following table shows, emission mitigation and costs can be quite expensive.

Table 7-4

2001 Offset Prices Paid in California (\$/ton)¹

	NOx	SOx	CO	PM	VOC-HC
Average (mean)	\$27,074	\$12,809	\$19,447	\$46,148	\$12,684
Median	\$22,000	\$7,500	\$10,026	\$25,000	\$10,959
High	\$104,000	\$82,192	\$43,836	\$126,027	\$66,000
Low	\$774	\$15	\$45	\$400	\$967

1. California Environmental Control Agency, 2002

If the impacts of carbon (CO₂) removal are added, as Table 7-5 shows⁶⁶, the integrated gasification combined cycle facility has the lowest electricity costs – 6.9 cents/kWh levelized IGCC cost versus 7.6 cents/kWh for the direct fired coal versus 7.9 cents/kWh for the natural gas CC. If the cost of CO₂ removal, transport, and sequestration are considered, the IGCC facility remains the least expensive form of electricity, and direct fired coal becomes the most expensive at 8.6 cents/kWh. To quote the EPRI study: "Several studies have shown that removal of CO₂ from syngas in an IGCC prior to combustion is significantly less costly than CO₂ removal from the huge volumes of stack gases after combustion".

Table 7-5. Levelized Cost of Electricity in a CO₂ Constrained World

	Cost of CO ₂ Removal, Transport, and Sequestra tion (levelized ¢/kWh)	Cost of CO ₂ Removal, Transport, and Sequestra tion (¢/kWh)	Cost of Electricity w/CO ₂ Removal & Sequestra tion (Levelized ¢/Kwh)	Cost of Electricity w/CO ₂ Removal & Sequestra tion (¢/Kwh)
Direct Fire Coal	2.69	3.71	7.6	8.6
IGCC	1.41	2.26	6.9	7.7
NGCC	1.81	2.27	7.9	8.4

SOURCE: www.eprictcenter.com/infocenter/ and Table 7.3

⁶⁶ The Electric Power Research Institute (EPRI) conducted a study that examined the costs of CO₂ removal on various generation technologies. A summary is available at www.eprictcenter.infocenter/new_project/gen_planning/coal/FAQ.php3.

VII.3 Generation Diversity

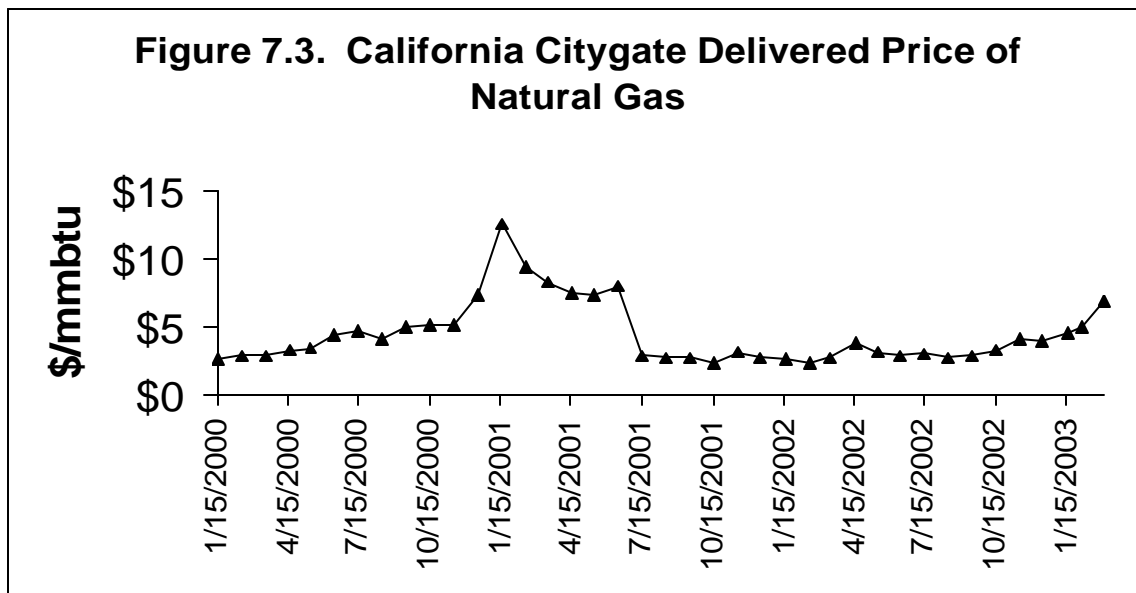
Table 7-6 shows the amount of installed generating capacity in California or owned by California utilities, the amount of capacity that has been added from 2000-2003, and the amount of capacity that is currently under construction and anticipated to be operating by 2006. The uninitiated reviewer would conclude the California is betting the ranch on natural gas generation. California started in 2000 with almost 60% of its total generation natural gas-fired, and virtually all of the generation that has been added since then, and is anticipated to be added by 2006, is natural gas-fired.

Table 7-6. California Installed Generation Capacity By Fuel Type.

	California Capacity Resource Diversity				
	2000		2002-2003	2003-2006	
	installed	2000	installed	installed	
	MW (1)	%	MW (2)	MW (3)	
Biomass	1,083	3%		129	
Coal	2,262	5%			
Geothermal	2,049	5%		415	
Hydro	5,372	13%			
Natural Gas	23,881	57%	6,022	3,311	
Nuclear	5,109	12%			
Oil	296	1%			
Solar	125	0%			
Wind	1,574	4%		767	
	41,751				
Notes					
1	California Energy Commission				
2	Table A-1: Preliminary Electricity and Natural Gas Infrastructure				
3	Tables 2-6, 2-7: Preliminary Electricity and Natural Gas Infrastructure Assumptions, California Energy Commission, 100-03-004SD, Feb. 11, 2003.				

With such a heavy interest emphasis on natural gas-fired generation one is tempted to ask, is this a prudent course of action? How well does this natural gas generation protect California customers from wild fluctuations in fuel prices?

Figure 7.3 shows recorded citygate delivery prices for natural gas in California for the last two years. The run up in gas prices during the winter of 2000/2001 ended up driving California utilities into insolvency and necessitated that the state stepping in to purchase electricity to keep the lights on. And now two years later, we are, as the pundit Yogi Berra once said, experiencing “déjà vu all over again,” with gas prices on a wild upward trajectory. For example, on February 24, natural gas spot prices hit \$19.00/mmbtu, a 600 percent increase from price levels in the fall of 2002.



The delivered price of gas can mask some of the fluctuations in gas prices, because the delivered cost of gas is a blend combination of long term contracts and short term purchases. A more indicative accurate indication of what expectations are in the gas market can be determined by looking to look at futures prices. Figure 7.4 shows the futures contract price for gas delivery in April 2003. These futures contract prices have quadrupled during the last year. Current (second week of March, 2003) natural gas futures prices for delivery the rest of 2003 are in the \$5.50-\$6.00/mmbtu range, double what they were a year ago, and almost twice the breakeven cost of gas beyond which a coal generation facility becomes less expensive than natural gas combined cycle facility.

There are a number of entities that will prognosticate on future natural gas availability and natural gas prices. Suffice it to say that California has been burned once by a run-up in natural gas prices, and the only reason California is not in serious trouble now is because of all of the long run contracts entered into by the state during the last price spike, effectively insulating us from most of the current price volatility. However, these contracts are of limited duration and most will end during the next decade. Current electricity prices for NP 15 and SP 15 have dropped from the 8.5 ¢/kWh range in February to 5.5-6 cents/kWh, higher than the 30 year levelized cost of electricity from an IGCC plant starting 3 years from now (shown in Table 7-2).

Figure 7.4. Natural Gas Futures Prices – April 2003 Delivery⁶⁷



⁶⁷ Source: Coralconnect.com

The California Energy Commission, as part of its Integrated Energy Policy planning for the state⁶⁸ assumes that Mohave is retired in 2005:

“The baseline assumes the retirement of the coal-fired Mohave units in Laughlin, Nevada. In order for the facility to remain in operation, it will be necessary to install emission controls and resolve issues related to water source and fuel delivery. As estimates of the financial cost of the necessary upgrades exceed \$1 billion, prudence dictates that we assume the plant ceases operation at the end of 2005.”⁶⁹

Table 2-10 in that same Energy Commission report shows that Edison needs to add 1,700 more megawatts of new generation in the next ten years to maintain target reserve margin levels comparable to the levels found in 1998-1999. Of that 1,700 MW, 1,275 MW is base load generation.

California is supposed to develop “energy policies that balance the goals of supporting economic development, improving environmental quality and promoting resource diversity”⁷⁰, and this Commission is supposed to support those goals. We would submit to you that retiring one of the few available non gas-fired base load generators (Mohave) and replacing it with yet another natural gas-fired generator is not promoting resource diversity.

However, replacing Mohave with an IGCC facility would be a solution to a host of problems. It would reduce emissions, reduce water consumption, diversify the California generation mix, provide a hedge against wildly fluctuating natural gas prices, maintain economic assistance to the tribes that inhabit Black Mesa, all at an electricity cost comparable to a direct fired coal plant (and significantly cheaper than direct fired coal when CO₂ clean-up costs are included), while putting California on the forefront of the new wave of fossil fuel generation technologies.

⁶⁸ Docket 02-IEP-01.

⁶⁹ Preliminary Electricity and Natural Gas Infrastructure Assumptions, California Energy Commission, 100-03-004SD, Feb. 11, 2003, Chapter 2, page 11, Table 2-6.

⁷⁰ Integrated Energy Policy Report Proceeding, California Energy Commission, Docket 02-IEP-01, Report 100-03-001SD, page 1, February 11, 2003.

There is a lot of non utility (non ratepayer) money available for such an effort. In addition to the \$8 billion in clean coal funding available, the Secretary of Energy, on February 27, 2003, announced \$1 billion for the development of a prototype coal gasification facility with the zero emissions as part of the United States' lead in developing carbon capture and storage technologies⁷¹:

“Rather than using traditional coal combustion technology, the plant will be based on coal gasification which produces a synthesis gas in which the coal's carbon is converted to a “synthesis gas” made up primarily of hydrogen and carbon monoxide. Advanced technology will be used to react the synthesis gas with steam to produce additional hydrogen and a concentrated stream of CO₂. Initially the hydrogen will be used as a clean fuel for electric power generation either in turbines, fuel cells or hybrid combinations of these technologies. The hydrogen could also be supplied as a feedstock for refineries. In the future, as hydrogen-powered automobiles and trucks are developed as part of President Bush's Hydrogen Fuels Initiative, the plant could be a source of transportation-grade hydrogen fuel. The captured CO₂ will be separated from the hydrogen perhaps by novel membranes currently under development. It would then be permanently sequestered in a geologic formation. Candidate reservoir(s) could include depleted oil and gas reservoirs, unmineable coal seams, deep saline aquifers, and basalt formations – all common in the United States.”⁷²

This is precisely the kind of effort California should be participating in, rather than trying to slap emission control technologies on a 40 year-old coal burning power plant.

VII.4 Location

Another distinct advantage to the replacement of the Mohave plant with an IGCC facility is that the IGCC facility could be located close to the coal source. With an IGCC facility it would no longer be necessary to ship the coal 300 miles from Black Mesa to Nevada. This

⁷¹ <http://www.fe.doe.gov/techline/> or <http://www.energy.gov/HQPress/releases03/febpr/pr03041.htm> The managing utility only has to come up with 20% of the costs, the government will pay the rest.

⁷² http://www.fe.doe.gov/coal_power/integratedprototype/futuregen_factsheet.pdf

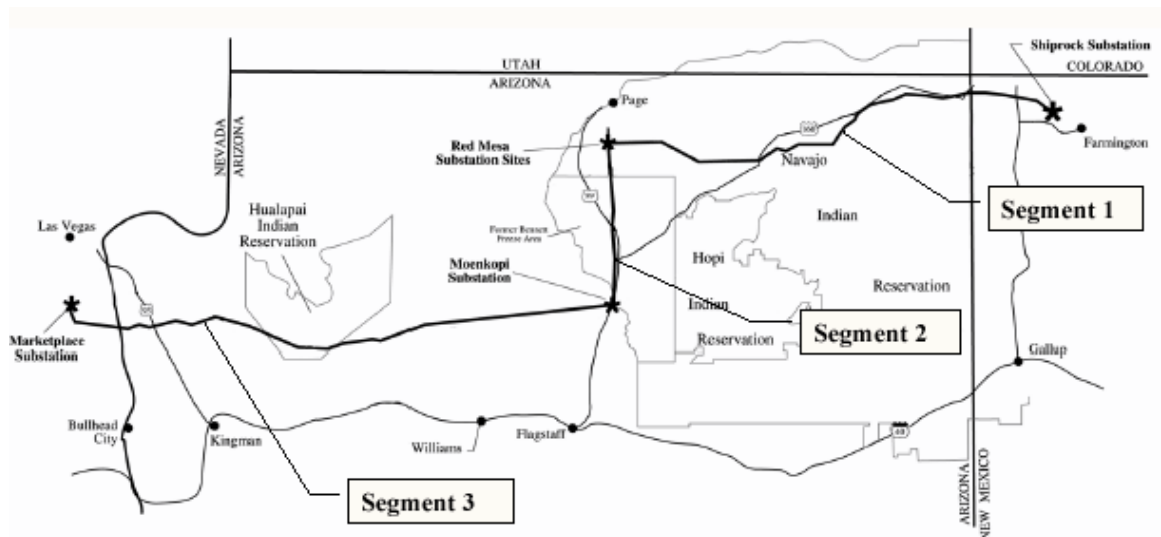
would eliminate one of the major uncertainties and points of contention in the area, the use of groundwater to ship the coal off the mesa.

As Table 5-3 showed, IGCC facilities can be constructed that use very little water. Whereas Mohave loses 25,000+ acre-ft water a year, a comparable sized zero emission IGCC facility would use 100-200 acre feet of water a year. This amount of water could be easily supplied from the existing surface water impoundments in the mining area on the mesa, and not have to utilize any ground water.

One of the historic limitations with siting power plants in this area has been a lack of available transmission access out of the area. There is a new transmission project – the Navajo Transmission Project- that will extend from Western Area Power Administration’s Shiprock Substation in northwestern New Mexico to the Marketplace Substation south of Boulder City, Nevada (Figure 7.5). This new transmission line has the following purposes: relieving transmission system constraints to the shipping of electrical power in the area, increasing operating flexibility and reliability of the regional transmission grid, and allowing new power plant development in the Four Corners region.

This transmission project would allow easy interconnection of an IGCC facility in the Kayenta or Moencopi area. The availability of this new transmission line could also allow the development of renewable resources in the area, particularly the development of solar resources on the mesa. The developers of this line are currently seeking long term capacity contracts for portions of the line capacity.

Figure 7.5. Navajo Transmission Project⁷³



⁷³ From “New Transmission New Transmission Development Company Development Company (Trans Elect Subsidiary) Diné Power Authority “, Navajo Transmission Project Navajo Transmission Project, January 17 th , 2003.

VIII. CONCLUSIONS AND RECOMMENDATIONS

What will happen in this proceeding will determine investments in a generation technology that will operate for the next 30 years. Expressed in the vernacular of the day - direct fired coal is so last century. It is cheap, but it is dirty, it is inefficient, and it wastes water.

Rather than approving a retrofit of a 40 year old technology, the Commission should consider likely future environmental concerns and restrictions and approve investments only in a technology or technologies that are likely to be compatible with 21st century power plant operating conditions. Instead of retrofitting a 40- year- old coal plant with air pollution controls, the construction of an integrated gasification combined cycle facility for the same amount of money would result in more efficient use of coal and dramatic reductions in emissions and water losses, while insulating California ratepayers from the vagaries of natural gas price fluctuations. An IGCC facility can make clean and efficient electricity, as well as provide needed hydrogen fuel.

Based on the testimony provided herein, we have the following recommendations for the Commission in this phase of this proceeding:

- The Commission should disapprove any N-aquifer water pumping for coal transport from Black Mesa. Regardless of whether or not it can be scientifically demonstrated that permanent damage to the N-aquifer is occurring, there are enough disturbing symptoms – such springs drying up and sinkhole and fissure development on the mesa – that the continued pumping of the N-aquifer for coal slurry use is a Sword of Damocles hanging over the heart of the oldest cultures in the United States and it should be ended.
- Freshwater in the American Southwest is a valuable commodity and likely to become more valuable in the future. Ground water should not be used to produce coal slurry, and its use should be minimized where viable in electric power generation. There are alternatives, such as the use of reclaimed water and dry cooling, as well as alternative generation technologies that should be investigated prior to approval of any proposed modifications to any generation technology by this Commission. The Commission should disapprove of any investments in generation that use ground water for fuel transport.

- The closure of the Black Mesa Mine on Black Mesa, even temporarily, will have devastating economic impacts on the region and cultures in the area. The Commission should open another phase of this proceeding to address the mitigation measures and transition when the Mohave Generating station closes in 2006.
- Direct fired coal facilities are dirty and waste water, and continued investment in them by California utilities is short sighted and is inconsistent with California state policies.
- There are alternatives to direct fired coal that offer significant environmental benefits, in terms of efficiency, emissions, and water use. These alternatives could also eliminate the major source of uncertainty and contention in this proceeding, the use of ground water to ship coal to Nevada. These alternatives could be located close to the coal source, continue to provide local economic support, and enhance California's fuel diversity and reduce our reliance on natural gas.
- Generation alternatives to Mohave should be investigated in lieu of approving additional investments in expensive retrofits of direct fired coal facilities. The Commission should direct Edison to replace Mohave with clean coal technology alternatives.

In summary, there will be calls in this proceeding to stick with what we know, not push the envelope, take the path of least resistance and least risk, and slap retrofits on a 20th century technology. That would be short sighted. We are issuing a call for California to take a national leadership role in developing generation technologies for the 21st century. This can be done at comparable costs to continued investments in direct fired coal plants, significantly reduce emissions and water use in the Desert Southwest, be consistent with California emissions and water use policies, continue to provide economic support to the Hopi and the Navajo people, and diversify California reliance and dependence on natural gas.

Respectfully submitted,

By: _____

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Date: March 26, 2003

CERTIFICATE OF SERVICE

I, Lon W. House, do hereby certify that I served:

WATER & ENERGY CONSULTING, HOPI AND NAVAJO TESTIMONY

by electronic mail and U.S. Mail on the parties listed on the Service List for the proceeding in California Public Utilities Commission Docket No. A.02-05-046.

I declare under penalty of perjury, pursuant to the laws of the State of California, that the foregoing is true and correct.

Executed on March 26, 2003 in Cameron Park, California.

Lon W. House