

## Credibility Concerns for

### *Responses to Questions Regarding Cloud Seeding in the Lake Almanor Basin*

Provided by Pacific Gas & Electric

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There are a number of aspects of the *Responses to Questions Regarding Cloud Seeding in the Lake Almanor Basin* provided to the public and ABWAC by Pacific Gas & Electric which compromise the document's credibility and adversely impact the document's utility as a source for developing recommendations to the Plumas County Board of Supervisors.

1. Much of the data presented in the *Response* is inaccurate or confusing.

Since both natural silver in solution and silver in nanoparticle form, as well as nanoparticles in general, appear to be toxic at very low concentrations, adequate evaluation of the human and environmental risks for the Almanor Basin posed by cloud seeding depends on reliable information. Some of the problems with the data that need addressing are as follows:

a) Table 1, page 6:

How were the amounts of silver iodide released during each cloud seeding season determined? If they were based on use of the rate factor (21.5gm/hr.; page 6), many of the numbers are not accurate. What was the duration (hours) of each daily seeding operation? How much AgI<sub>2</sub> was released during each day of operation? Was each of the 9 or 10 seeders operated for the same length of time each day?

b) Pages 7 and 11:

On page 7 it is stated that particles formed by the flaming operation are 0.05 to 0.100 microns. On page 11 it is stated that they are approximately 100 nanometers. Nanoparticles are generally defined as less than 0.100 microns or 100 nanometers.

c) Page 8:

As stated, EPA sets a secondary standard (maximum contaminant level, MCL) for silver in drinking water at 100ug/L (100 parts per billion, ppb); however this is not for silver in nanoparticles.

d) Page 9 and Tables E-2 and E-3.

There appear to be inconsistencies regarding the silver concentrations measured in Lake Almanor. Tables E-2 and E-3 list detected values as parts per million. Text on page 9 indicates values are in parts per billion. Footnotes on tables indicate that parts per million is equivalent to ug/L. Concentrations in ug/L are parts per billion. The method detection limit and reporting limit are not consistent on Table E-2 or Table E-3.

e) Tables E-2 and E-3:

There is no indication of how these measurements were made, whether the method or laboratory was the same, or whether these measurements are of total silver or silver in nanoparticle form.

2. The first paragraph on page 13 is not correct. PM 10 refers to particles  $\leq 10$  microns (10,000 nanometers, nm) in size and is regulated by EPA. PM2.5 refers to particles  $\leq 2.5$  microns (2,500 nm) in size, is regulated by EPA and used as a criteria pollutant. PM2.5 particles are defined as fine particles, not ultrafine particles. Nanoparticles are defined as particles 1 to 100 nm and termed ultrafine particles. Regulations concerning their use are minimal.

3. Page 3 states:

“The studies all conclude that silver iodide used in cloud seeding does not have

environmental effects because it is practically insoluble, does not tend to dissociate to its

component ions of silver and iodine, and is not bioavailable in the aquatic environment but

instead remains in soils and sediments.”

The data in Table E-2 indicates that this not the case and that silver is in fact present in the water both in Lake Almanor and downstream in the North Fork of the Feather River. Based on presence at the Hamilton Branch Powerhouse, it is also in the water in Walker Lake. Regardless of which concentration is accurate for Table E-2, the levels measured are above the range of concentrations which produce toxicity in aquatic fish and invertebrates.

4. One of the arguments to support a lack of risk for AgI is that it “is not bioavailable in the aquatic

environment but instead remains in soils and sediments.” Does PG&E have test data to demonstrate that this is in fact the case? The test data made available by PG&E suggests the opposite.

5. With the exception of one time period (April 4-6, 2000, Table E-2), the test data provided by PG&E do not include times when cloud seeding was actually occurring. This assumes that Table 1, page 6, is correct for 2000. Since the cloud seeding season extends over two calendar years, does Table 1 include the information for the Winter Season in which the silver detected on April 4-6, 2000 was released?

6. Page 10 refers to “comprehensive monitoring studies of the effects of cloud seeding” in the Almanor Basin as part of the FERC relicensing process. Could PG&E make those studies available to the committee? Are they different from the data presented in the Response?

7. The Response does not address the impact of nanoparticles in general and the fact that their interactions with fluids and with living systems, regardless of their chemical composition, are very different from that of the same chemical in non-nanoparticle form. Even if, as PG&E suggests, AgICI in nanoparticle form does not dissociate in water, it would still likely act as a nanoparticle in its association with living cells. The range of these activities is outlined well in the recent review for OEEHA by UCSF, in numerous other reviews and on the EPA website.

8. The Response provides no evidence that AgICI in nanoparticle form does not dissociate in water nor has PG&E demonstrated the AgICI in nanoparticle form has no interactions living cells or organisms.

Pacific Gas & Electric has the opportunity to directly address public concern for the risks to the health of the Almanor Basin and reestablish a measure of credibility with the general public concerning their corporate policies regarding public and environmental safety by providing the following to amplify the Response:

1. Records and other documents (manifests, bills of lading, operational logs, etc.) from which the amounts of AgICI used during cloud seeding, as presented in Table 1, were determined and how the calculations were made.

2. Records and other documents (analytical reports, sampling logs, site maps, etc.) from which the data in Tables E- and E-2 were derived.

3. Documents (operational logs, etc.) from which the operational information (days, total hours) in Table 1 were derived.

4. Information for the 1999-2000 cloud seeding season added to Table 1.
5. Documents (manifests, bills of lading, manufacturer/supplier content information, operational logs, etc.) to substantiate the statements (paragraphs 1 and 2, page 6) regarding the chemical composition of the cloud seeding particles and the chemicals loaded into the cloud seeding burners used in the Almanor Basin.
6. Data and substantiating documents for studies conducted by PG&E (section 6.1, page 10) in the Almanor Basin for the FERC relicensing of the hydroelectric project here.
7. Study data and documents demonstrating that silver and other chemicals produced by cloud seeding remain in surface soils and lake sediments in the Almanor Basin.