FINDING OF NO SIGNIFICANT IMPACT

DOE PARTICIPATION IN THE OCEAN SEQUESTRATION OF CO_2 FIELD EXPERIMENT

AGENCY: U.S. Department of Energy (DOE)

ACTION: Finding of No Significant Impact

SUMMARY: DOE has prepared an Environmental Assessment (EA), DOE/EA-1336, titled *Ocean Sequestration of CO_2 Field Experiment*, to analyze the potential environmental consequences of participating in an experiment to test the dissolution and dispersion of liquid carbon dioxide in ocean water at moderate depth. The results of the analyses provided in the EA are summarized in this Finding of No Significant Impact (FONSI).

The ocean sequestration experiment would be conducted as a joint international effort, with involvement by the governments of Australia, Canada, Japan, and Norway and the participation of private entities, such as Asea Brown Boveri (ABB) and the Central Research Institute of Electric Power Industry (CRIEPI) in Japan. DOE would participate in the implementation and administration of the experiment through representation on a steering committee responsible for overall direction and scope of the experiment and for oversight of the planning and conduct of experimental activities. DOE would provide funds for development of experimental plans, public outreach, permitting, data analysis, modeling predictions, and other support functions; the DOE funding would equate to about 20% of the total estimated cost of the experiment.

The primary purpose of the *Field Experiment* would be to develop the data needed to verify scientific principles and to test, validate, and refine computer models used for predicting the behavior of carbon dioxide released into the ocean at moderate depth. Specific technical objectives of the experiment include the following:

- Investigating the dynamics of a cloud of liquid CO_2 droplets with varying droplet sizes and released at varying velocities
- Tracing the evolution of carbon-enriched seawater resulting from dissolution of the CO_2 droplets
- Examining both the effects that hydrate formation might have on dissolution of the CO_2 droplets and the effects on seawater acidity within and on the margins of the droplet plume
- Establishing the effects of the experiment on bacterial biomass, production, and growth efficiency due to induced changes in seawater acidity

Information obtained from the experiment would be used, if needed, for future policy decisions on the viability of ocean sequestration as an option to mitigate potential effects (climate change) caused by carbon dioxide build-up in the atmosphere, which results primarily from combustion of fossil energy sources. Information developed from the experiment would complement other DOE-sponsored research on approaches with potential for managing increases in atmospheric levels of carbon dioxide, such as geologic or terrestrial sequestration, recovery and use, efficiency improvements in energy production and use, and use of alternative energy sources. Ocean sequestration of carbon dioxide would complement natural processes that occur at the ocean surface,

where carbon dioxide gas from the atmosphere dissolves into seawater and is eventually transported and dispersed into deeper layers of the oceans. The experiment would also enable parties studying global climate change to gain an improved understanding of CO_2 dispersion in the ocean. Data generated from observations of dispersal and mixing would enable tuning of oceanographic models for improved representation of the effects of ocean turbulence.

Based on the analyses in the EA, DOE has concluded that the carbon sequestration experiment will result in minimal and insignificant consequences to the human environment. Thus, DOE considers that the proposed action, for participation with a group of friendly nations and private entities in the conduct of the experiment, is not a major Federal action significantly affecting the quality of the human environment, within the meaning of the National Environmental Policy Act (NEPA) of 1969, 42 United States Code 4321, *et seq*.

DOE has, however, identified several additional measures beyond those incorporated into the EA, including adjustments to the experimental plan, to decrease the perceived risks and expressed public concerns regarding the potential consequences of the experiment on the human environment. Those additional measures are identified as commitments in this FONSI and, pursuant to Title 10, Code of Federal Regulations (CFR), Part 1021.331, have been incorporated into a Mitigation Action Plan. Therefore, in accordance with 10 CFR Part 1021.322, DOE has concluded that preparation of an Environmental Impact Statement is not required, and DOE is issuing this FONSI.

COPIES OF THE EA ARE AVAILABLE FROM:

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BACKGROUND: In 1997, DOE signed an agreement with parties representing the governments of Japan and Norway for international collaboration to determine the technical feasibility and to improve understanding of the environmental impacts of CO_2 ocean sequestration, in order to advance knowledge on the behavior of CO_2 release in the ocean. Subsequently, additional parties representing

Canada and Australia and private entities ABB and CREIPI have joined the agreement, which provides for a steering committee, consisting of one representative from each party, to manage the overall direction and scope of the effort. A technical committee, comprised of representatives from the implementing organizations of the participating countries, was also established to formulate and execute annual work plans.

The implementing organization for Government of Japan – the Research Institute of Innovative Technology for the Earth, as part of its contribution to the proposed experiment, contracted with the Pacific International Center for High Technology Research based in Honolulu, HI, to establish the infrastructure required for the experiment. DOE participates on the steering committee and provides support for public outreach, permitting, and conceptual planning. DOE's funding constitutes approximately 20% of the estimated total funding for conduct of the experiment and for supporting activities.

From inception of the international agreement through 1999, ideas and concepts for ocean sequestration and appropriate seawater and site conditions for the conduct of a research experiment were examined. Test releases of CO_2 would need to occur at a minimum depth of 800 meters to adequately evaluate the ocean sequestration concept, and ocean locations with reasonable proximity to land and relatively calm weather and surface wave conditions were considered to be logistically important. In January 2000, following progress on concept definition to the point of adequacy for environmental analysis, DOE issued a determination to prepare an Environmental Assessment for use in decision-making regarding the potential consequences to the human environment that might result from participation in the experiment.

PUBLIC PARTICIPATION: On August 8, 2000, DOE released a draft Environmental Assessment for review and comment. Alternatives analyzed in the EA included alternative locations, consisting of a site offshore from the western coast of the Island of Hawaii, a different (generic) ocean site possessing comparable characteristics within or beyond Hawaiian waters, and No Action. The EA was provided to Federal and State of Hawaii agencies and to the public for review and comment; copies were made available for review at libraries on the Islands of Hawaii and Oahu and in DOE public reading rooms.

Public notices announcing availability of the draft EA were placed in the Hawaii Tribune-Herald and West Hawaii Today newspapers on the Island of Hawaii and in The Honolulu Advertiser on the Island of Oahu. Announcements were also placed on a DOE web site (www.netl.doe.gov), on a web site (www.co2experiment.org) established to disseminate project-related information, and in a journal published by Hawaii's Office of Environmental Quality Control to announce plans and results of environmental studies for proposed projects in Hawaii.

Following a 30-day review and comment period, additional analyses and studies were performed, which culminated in release of the Final Environmental Assessment in March 2001.

DOE PARTICIPATION IN THE OCEAN SEQUESTRATION OF CO_2 FIELD EXPERIMENT

DESCRIPTION OF THE PROPOSED ACTION: The proposed action is for DOE to participate with a group of international organizations in a research experiment to test and evaluate the dispersion and dissolution of liquid carbon dioxide released into the ocean water of moderate depth.

To achieve experimental objectives, a preliminary experimental plan was prepared; this plan was included in the EA. The experimental plan would provide for a maximum of twenty intermittent, 2-hour tests, during which liquid carbon dioxide would be pumped from a tank on a surface vessel through flexible tubing to a release nozzle attached to a platform previously lowered from the surface vessel to the ocean floor, at a depth of about 800 meters. A cumulative total (maximum) of sixty tons (about 15,500 gallons) of liquid carbon dioxide would be released in a sequential series of tests with release rates ranging from near zero to a maximum of about 16 gallons per minute (gpm).

Carbon dioxide would exit the nozzle as a cloud of discrete liquid droplets that, based on the physical characteristics of the droplets and the surrounding ocean water, would not be expected to rise more than 300 meters above the nozzle (i.e., to a minimum depth of 500 meters below the ocean surface). As the buoyant carbon dioxide droplets rise in the water column, they would dissolve into the surrounding water since the natural concentration of inorganic carbon in seawater is substantially below the solubility limit for carbon dioxide. The dissolution of CO_2 would create relatively dense, carbon-enriched seawater that would sink to a depth of neutral buoyancy through mixing with the ambient seawater. During this process, the droplet cloud and the carbon-enriched seawater would drift with the prevailing ocean current and be further diluted by additional ocean mixing.

Due to the depth (water column pressure) and temperature of the ocean environment that would be experienced by the droplets between their release point and the point of maximum rise, the CO_2 would remain in liquid form. At the droplet surface, however, a coating termed a "hydrate," which is a complex between water and carbon dioxide, could form under certain conditions. This coating would slow the overall dissolution process. Experimental plans for CO_2 releases would be conducted to ensure that the droplets remain buoyant even with a hydrate coating.

Projections indicate that all surface vessel activity required to conduct the experiment could be completed within ten days, with only five days used for releases of CO_2. Deployment of equipment and sediment and water characterization would be conducted on the first day. Prior to the start of experimental activities on the second day, CO_2 would be released at a very small flow rate in order to test the remotely operated equipment planned for use in observing the CO_2 droplet rise. Subsequently, from day 2 through day 4, an initial series of seven tests would be conducted at the lowest planned CO_2 release rate of 1.6 gpm, and this would be followed by three tests at a release rate of 16 gpm. Day 5 would be used for sampling and observation and equipment changes, with no CO_2 flow. Following a nozzle change to produce droplets of a different size, four tests at a flow rate of 1.6 gpm would be followed by three tests at the higher release rate on days 6 and 7, which would mark the completion of the experimentation. Sampling and observation and retrieval of all underwater equipment would be performed on the following two days.

Monitoring of the released CO_2 droplets would be conducted using remotely operated vehicles, a manned submersible, and an array of bottom-mounted and ocean instrumentation. Monitoring would be conducted to follow the lateral, vertical, and downcurrent movement of the cloud of liquid droplets and the plume of carbon-rich water resulting from dissolution of the droplets. As the carbon dioxide dissolves into the ocean water, the acidity of the water would increase from an ambient pH level of about 7.6 at 800-meter depth. Predictions from computer modeling indicate that all ocean water affected by a release of CO_2 would have a pH level higher than 6.5 within three hours after a release has stopped, by which time the plume of carbon-enriched water would be transported about 550 meters downcurrent from the release nozzle based on a prevailing current speed of 5 centimeters per second at the seafloor depth of 800 meters. Model predictions indicate that the pH of all affected water would return to the ambient level of 7.6 within about 12 hours.

The experimental activities would be reviewed and the environment conditions would be closely monitored for the purpose of implementing contingency measures whenever warranted. Contingency actions, ranging from alteration of experimental operations to suspension or termination of carbon dioxide release, would be triggered under the following conditions:

- Observation of unusual mortality of marine organisms collected for use and observation as test organisms; these organisms would be carried in traps attached to remotely operated vehicles that would traverse the plume of CO_2 droplets and carbon-enriched water for data collection;
- Observation of unusual mortality of fish, squid, or other free-swimming organisms in the water column;
- Observation of unusual mortality of benthic organisms;
- Observation of CO_2 droplets reaching the surface;
- Measurement of pH levels below 6.0 more than 100 meters from the release nozzle;
- Observation of threatened or endangered species in the vicinity of the release nozzle;
- Observation of significant numbers of sensitive species in the area potentially impacted by the experiment;
- Observation of large aggregations of organisms transiting the area in or near the CO_2-enriched water plume;
- Measured noise levels that are substantially higher than expected or observations that noise levels are affecting the behavior or macrofauna near the release platform; and
- Observations by shipboard spotters of substantial aggregations of any threatened or endangered species.

ENVIRONMENTAL CONSEQUENCES: The Environmental Assessment included analyses of the potential impacts of the proposed *Ocean Sequestration of CO_2 Field Experiment* on the following elements of the human and natural environment: water quality; marine resources; historic and cultural resources; air quality and climate; noise and vibration; transportation; land use; aesthetics; socioeconomics; public facilities and services; safety & health; biodiversity and environmentally sensitive resources; environmental justice; and pollution prevention.

The analyses identified that the most notable consequences of the experiment would result from the following activities or environmental changes: placement of experimental and monitoring equipment on the ocean floor; interactions of CO_2 with seawater, resulting in temporary increases in acidity; and the physical presence and movement of surface vessels required to support the proposed project. No substantive adverse impacts were identified from analyzing the effects of these changes.

WATER QUALITY:

During each test, the release nozzle would create an initial cloud of CO_2 droplets. Computer modeling indicates that this droplet cloud would initially rise to a maximum height of 60 to 120 meters above the release nozzle (to a point 740 to 680 meters below the ocean surface) due to the lower density of carbon dioxide liquid in relation to seawater. The droplet cloud would also spread laterally from the release point to a width of about 20 to 30 meters and would continue to move with the prevailing ocean current at the depth of the experiment, and the CO_2 would gradually dissolve into the ocean water.

Complete dissolution of the carbon dioxide droplets would occur within about 100 meters downcurrent from the release nozzle. The resulting plume of carbon-enriched seawater would gradually dissipate with time, and the dissolution process would result in an increase in the acidity of the affected seawater from the ambient pH value of 7.6 at a depth of 800 meters. Computer models predict that pH levels of 6.5 or less would be expected to persist for no more than 3 hours after a CO_2 release is stopped, while the plume would have drifted down current for a distance of about 550 meters. The pH level of all water affected by a release of CO_2 would be expected to be at the level of the ambient water (pH = 7.6) within 12 hours.

Research vessels used for the experiment would manage bilge and ballast water to minimize pollution and the introduction of non-indigenous or exotic species into waters at the ocean site for the experiment.

MARINE RESOURCES:

Section 7(a)(2) of the Endangered Species Act directs Federal agencies to consult with the Department of the Interior to insure that any Federal action authorized, funded, or carried out is not likely to jeopardize the continued existence of any endangered or threatened species or to result in the destruction or adverse modification of the habitat of such species. The U.S. Department of the Interior/Fish & Wildlife (F&W) Service was consulted and confirmed that the proposed project would not be likely to result in any adverse effects on seabirds or Federally listed or State-protected animal or plant species under the jurisdiction of the F&W Service. The F&W Service did, however, provide suggestions and recommendations for further assuring that adverse effects would not result, and mitigation measures appropriate for addressing those recommendations will be incorporated into the plans for the proposed project.

Consultation with the U.S. Department of Commerce, National Marine Fisheries Service (NMFS), regarding marine mammals and protected species confirmed that the small-scale nature of the proposed experiment would not be likely to adversely affect marine mammals and threatened or endangered species or their critical habitat. The NMFS did, however, provide recommendations for further assuring that the experiment would not adversely affect marine mammals, and mitigation measures appropriate for addressing those recommendations will be incorporated into project plans.

The EA analyzed the potential consequences that would result from ten deployments of the CO_2 discharge equipment. Deployment and movement of equipment required for the experiment would be expected to produce some abrasion of the seafloor at the site of the experiment. While the experiment would be conducted at a site with an absence of coral resources, a potential for stress and mortality on benthic life beneath experimental equipment would be anticipated. Each equipment deployment would be expected to result in potential for abrasion of 0.4 square meters of seafloor from the nozzle platform and 1.8 acres from the discharge tubing. The small size of the equipment contact area would result in insignificant adverse effect on benthic marine life. Current projections indicate that two deployments of the discharge equipment could be sufficient for collection of all needed experimental research data; this limitation on the number of deployments for nozzle changes will be incorporated as a mitigation measure to minimize the potential for adverse effects.

Marine life present at the seafloor depth (about 800 meters) of the proposed experiment consists of sediment assemblages of microbes, macro- and mega-fauna, and meiofauna. Sediment dwelling organisms typically consist of marine worms (polychaetes); starfish and sea urchins (echinoderms); shrimp, crab, and lobster (crustaceans); and bivalves. Sponges, crinoids, deep-sea corals, and other sessile cnidarians can also dwell on hard substrates. Shrimp, snappers, and deep-sea precious corals constitute exploited species that live or feed on the seafloor at about 800-meter depth. Examinations of seafloor videotapes indicate that the habitat and biota at the site off the western coast of the Island of Hawaii are typical of the slopes of the main Hawaiian Islands. Deep-sea benthic species are distributed at similar depths on the slopes of all the main Hawaiian Islands.

The greatest concentrations of zooplankton generally occur within 250 meters of the ocean surface, but below a depth of about 200 meters the plankton biomass in the seawater declines significantly with increasing depth. At the depth of the bulk of the plume of CO_2-affected water (i.e., below about 700 meters), the zooplankton density would be expected to be very low. Organisms in the midwater region from 200-meter to 1,000-meter depth depend on the surface waters for virtually all of their food. Vertebrate density at depths below 200 meters is relatively low, although some surface-associated species, including marine mammals, sea turtles, and fishes, may forage at these depths. The most common organisms present in the midwater regions are shrimp, squid, and small fishes.

The most abundant and ubiquitous organisms in the surface waters less than 200-meter depth are plankton. At the site off the western coast of the Island of Hawaii, a variety of pelagic fish species exist in the surface water, including tunas, billfish, swordfish, and dolphin. These species would not be expected to descend to depths greater than 500 meters, which would be above the predicted level

of rise of CO_2-enriched water from the release point.
Data on the effects of acidity levels on marine organisms indicate that exposure to seawater with a pH as low as 6.5 for a time duration approaching 24 hours would not result in substantial levels of mortality to marine macrofauna and plankton. However, the potential exists that injury to certain marine organisms would result if exposures to seawater with a pH lower than 6.5 persist for a sufficiently long period of time. During the three-hour period when exposures to pH levels of 6.5 or lower would be possible in a portion of the plume of CO_2-enriched water from each test release, some losses of deep-water plankton and effects on mobile communities would be expected. However, due to the relatively short time duration when acidity levels would be sufficiently high to cause adverse effects and due to the anticipated low density of zooplankton in water at the ocean depths affected by the experiment, no substantial adverse effects would be expected. No adverse effects on surface water marine life would be expected, and only minor stress on midwater plankton populations would be anticipated.

Threatened and endangered reptile and mammal species are not normally found at ocean depths that would experience any changes in water quality as a result of the experiment. For any of these air-breathing species that do descend to such depths, the time duration spent at the depth of affected ocean water would be limited due to the need to return to the surface. In addition, the affected ocean water would exhibit acidity levels that would not be expected to be caustic to body surfaces.

HISTORIC AND CULTURAL RESOURCES:

No impacts on archaeological or historic sites would occur. Consultation with the State of Hawaii's Historic Preservation Division has confirmed that no adverse effects on historic properties listed, or eligible for listing, in the National Register of Historic Places would result from the proposed project off the western coast of the Island of Hawaii. A cultural resource study confirmed the existence of traditional practices associated with fishing and the significance of ocean currents in guiding both continuation of those practices and exercise of religious beliefs. The proposed project would have no effect on currents at any depth and, aside from the presence of surface vessels for a maximum of two weeks during the proposed experiment, no physical disruption of fishing practices would exist during the experiment. As previously noted, effects on marine species would not be significant.

AIR QUALITY AND CLIMATE:

Vessels used to conduct and support the experiment would produce air emissions from engine operations. These engine exhausts would be typical of emissions generated by ocean vessels and would not be expected to result in any significant effects on air quality.

None of the liquid CO_2 released during the experiment would be expected to escape into the atmosphere. In the event of an accident that would result in a tubing rupture near the ocean surface, rapid release of approximately one ton of CO_2 into the atmosphere would occur. This level of release would produce no significant impact on air quality. Standard precautions for maintaining and monitoring tanks, equipment, and tubing would be used to reduce risks that might result from a slow

leak of CO_2.

NOISE AND VIBRATION:

Elevated sound levels would be created from operation of research vessels and experimental equipment. These sounds would not be audible on land. The sound levels would be comparable to those typically produced from other ocean vessels. These temporary and intermittent low sound levels would not be expected to adversely affect marine species.

TRANSPORTATION:

Surface vessels would follow provisions contained in the "International Regulations for Prevention of Collisions at Sea" and provide an informative notice to local boating community regarding the test area and duration of operation. Small increases in vessel traffic would occur for short periods during the 2-week experiment. The presence of needed surface vessels would temporarily limit movements of other surface vessels in the vicinity of experimental activity. The normal activities of fishing boats, other vessels, and recreational ocean pursuits would not be significantly affected.

LAND USE:

Except for the use of existing and available land resources to provide logistical support for the experiment, no new requirements for land use would be expected.

AESTHETICS:

No alteration of the existing seascape or other visual amenities would result from the experiment.

SOCIOECONOMICS:

The experiment would result in purchases of currently marketed goods and services from local and nearby communities. No adverse socioeconomic effects would be expected.

PUBLIC FACILITIES AND SERVICES:

No new public services would be required for conduct of the experiment, and no measurable strain on existing facilities and services would be anticipated.

PUBLIC SAFETY & HEALTH:

Conduct of the experiment would not result in any significant safety or health consequences to the general public.

BIODIVERSITY AND ENVIRONMENTALLY SENSITIVE RESOURCES:

The subsurface ocean environment below 500 meters does not contain environmentally sensitive

resources. No effect on reef-building or precious corals, which are limited to depths far above the 800-meter depth of the experiment, would occur. Seafloor surveys indicate that the site off the western coast of the Island of Hawaii does not provide habitat for environmentally sensitive resources.

POLLUTION PREVENTION:

The experiment would use the minimum quantity of CO_2 release necessary to achieve the goals of the project, and both the number and the duration of tests would be limited to the minimum quantities needed to achieve experimental objectives. All equipment would be removed following completion of the experimental testing.

ENVIRONMENTAL JUSTICE:

The proposed action would occur well offshore in ocean waters of moderate depth. No disproportionately high or adverse impact on minority or low-income communities would be expected.

LONG-TERM AND CUMULATIVE IMPACTS:

Within 12 hours following completion of the final test release of CO_2, the affected ocean water would be expected to return to the ambient characteristics that existed before starting the experimental research. Any adverse impacts that would be experienced by sediment-dwelling marine life on the small area of seafloor that would be affected by equipment placement and movement would likely require months to several years for complete recovery.

ALTERNATIVES CONSIDERED: The alternatives considered in the Final Environmental Assessment consisted of (1) participation with the group of friendly nations and private entities in the conduct of the proposed experiment and (2) a No-Action Alternative, under which DOE would not participate in the experiment. For performing the experiment, vessel-based sites were considered – a site off the western coast of the Island of Hawaii and a Generic Ocean Site, each of which would need to possess the following set of qualifying characteristics for conduct of the proposed experiment:

- Water depth of approximately 800 meters (2,600 feet);
- Weather and wave regime that would allow research vessels to maintain position and not cause undue delays;
- Proximity to (and availability of) land-based support facilities needed for research vessels and associated scientists; and
- Absence of particularly sensitive natural resources in the potentially affected areas.

Examples of candidate sites for the research experiment were identified in Section 4.2.2.2 (Vessel-Based Concept) of the EA – these included sites offshore from the Hawaiian Islands, an offshore Norwegian location, and sites in the Gulf of Mexico offshore from Texas or Louisiana. A site

approximately 1.9 kilometers off Keahole Point, on the western coast of the Island of Hawaii, was identified in the EA as the best candidate site for the experiment; the characteristics of this site were used as the environmental baseline of existing marine conditions for consequence analysis.

However, conduct of the proposed experiment offshore from the Hawaiian Islands at a Generic Ocean Site possessing the requisite characteristics identified above was also considered in the EA. The potential consequences of conducting the experiment at such an alternative site would be similar to the potential consequences identified in the EA if the Generic Ocean Site possessed a seafloor and marine environment similar to that described in the EA for the Keahole Point site.

MAJOR ENVIRONMENTAL CONCERNS AND MITIGATION MEASURES:

DOE has determined that the proposed action, for participation through the international agreement in a research experiment for examining the dispersion and dissolution of liquid CO_2 in ocean waters of moderate depth, as defined in the Final Environmental Assessment, is not an action significantly affecting the quality of the human environment. This determination is based on the following: the lack of any significant adverse impacts that would occur as a result of the proposed action, as documented in the EA; the short duration of the experiment; the fact that each test release of CO_2 would be limited to a maximum duration of two-hours, during which affects would be examined; and the existence of a contingency plan for modification, suspension, or termination of experimental activities should unanticipated adverse effects be identified.

DOE considers, however, that additional measures or precautions would be appropriate to further reduce perceived uncertainties and public concerns about the proposed research experiment. Therefore, DOE commits to participate in the proposed experiment based on agreement by the consortium of international participants involved in the experiment that the following additional mitigation measures will be incorporated into planning and conduct of the proposed experiment:

(DOE) Mitigation Measure # 1. The ocean site for the experiment shall be relocated away from prime fishing grounds, such as those that exist off Keahole Point, Hawaii. While conduct of the proposed experiment at the Keahole Point site would not be expected to result in any significant impacts, DOE has determined that location of the experiment at a site away from the prime fishing ground off the western coast of Hawaii but within waters possessing comparable characteristics further from the Hawaiian coastline would be environmentally preferable. Candidate locations are:

- approximately 18 nautical miles due north of the Keahole Point, Hawaii, site (12 nautical miles offshore) at 20° 1’ 34” N, 156° 5’ 6” W
- approximately 8.5 nautical miles offshore from Barbers Point, Oahu, at 21° 12’N, 158° 6’ W, about 10 nautical miles from the existing ocean dumping sites located south of Pearl Harbor
- approximately 4 nautical miles offshore from Nawiliwili Harbor, Kauai, at 21° 55’ N, 159° 17’ W

(DOE) Mitigation Measure # 2. The experimental planners shall confirm and document, based on visual observation, measurement, or sound professional judgement based on reliable public evidence, that the site selected for relocation of the proposed experiment possesses both the requisite characteristics for conduct of the proposed experiment and seafloor and marine life characteristics comparable to, but not more environmentally sensitive than, those identified in the Final Environmental Assessment.

(DOE) Mitigation Measure # 3. The experimental planners shall identify a group of non-project-affiliated individuals possessing knowledge of the scientific and technical principles and expertise on the ocean environment and marine life that are relevant to the planning and implementation of the experiment. This group shall provide advice and counsel regarding the experiment and shall be provided an opportunity to observe experimental activities.

(DOE) Mitigation Measure # 4. During conduct of experimental activities, the chief biologist shall be assigned as the final authority for decision-making regarding potential significance of observed effects on marine life and shall possess authority to modify (including the possibility of suspension or termination of a release of CO_2) the experimental protocol after notification and discussion with the chief scientist. If a release is suspended or terminated, the chief biologist, after consultation with the chief scientist, the advisory group, and others, shall determine the schedule, conditions, and parameters for resumption of experimental activities.

(DOE) Mitigation Measure # 5. Except for required and essential maintenance, the experimental planners shall limit the total number of deployments of the release platform and tubing to a maximum of two – one deployment each for testing one of two different nozzle configurations.

In addition to the specified mitigation measures, the experimental planners shall implement relevant recommendations identified during DOE's consultation processes. These recommendations, which have been incorporated as mitigation measures for the experiment, consist of the following:

Recommendation # 1. Suspend or delay any release of CO_2 if aggregations of marine mammals or protected species are observed within a project corridor that might be affected by the experiment. Define that safety zone and search area and prescribe the methods and approach to be used for marine mammal searches. Submit the plan to the National Marine Fisheries Service (NMFS) at least 30 days prior to initiation of the experiment.

Recommendation # 2. Prepare and submit, to the NMFS and the U.S. Coast Guard at least 30 days prior to the initiation of experimental activities, a response plan for accidental releases of CO_2 and any other hazardous materials to be used during the experiment.

Recommendation # 3. Disseminate to the NMFS, other potentially interested parties, and the public, as soon as possible following completion of experimental testing, information from observations of marine mammals and protected species and from monitoring and measurement of the effects of CO_2

on the ocean environment.
Recommendation # 4. Monitor the behavior of the plume of seawater having a reduced pH if any substantial plume characteristics that were not predicted by the preliminary modeling should be identified.

Recommendation # 5. Monitor acute effects on animals near the CO_2 release point during the course of the experiment.

Recommendation # 6. Include in the experimental protocol provisions to modify the release (with respect to rate, timing, current, speed, or other factors), based on exceedences of threshold environmental conditions or anticipated monitoring results. Specify the ranges of conditions planned for environmental monitoring and the types of contingency actions that would be implemented if threshold conditions should be exceeded.

Recommendation # 7. Include in the experimental protocol provisions for video monitoring of the seafloor imprint created by the release platform and CO_2 transport tubing.

Recommendation # 8. Immediately suspend CO_2 release and communicate to the NMFS and the U.S. Fish & Wildlife Service if any adverse impacts to threatened or endangered species are observed and initiate consultation as appropriate.

FINDING: Based on the information and data contained in the Final EA, DOE finds that no significant impact would result from implementing the proposed Federal action, to participate in conduct of an approximately two-week duration experiment for testing the dispersion and dissolution of carbon dioxide in ocean waters of moderate depth. DOE also finds that implementation of the identified mitigation measures will further address public concerns and perceived uncertainties regarding the experiment and further ensure that adverse consequences would not occur. Therefore, consistent with Title 10 CFR, Part 1021.322, DOE has incorporated the identified mitigation measures into a Mitigation Action Plan for participation in the experiment.

This Finding of No Significant Impact is made pursuant to the National Environmental Policy Act (NEPA) of 1969 [42 U.S. Code 4321 *et seq*.]; the Council on Environmental Quality's Regulations for Implementing the Procedural Provisions of NEPA, Title 40 CFR, Part 1500-1508; and the DOE's NEPA Implementing Procedures, Title 10 CFR, Part 1021. The Proposed action does not constitute a major Federal action that would significantly affect the quality of the human environment within the meaning of the National Environmental Policy Act. Therefore, an Environmental Impact Statement is not required and DOE is issuing this FONSI.

ISSUED IN PITTSBURGH, PA, THIS DAY OF MAY 2001.

Rita A. Bajura
Director

National Energy Technology Laboratory