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Ms. Abigale Tardif, Esq.
Principal Deputy Assistant Administrator
U.S. Environmental Protection Agency
Office of Air and Radiation
Washington, D.C. 20460

Via Email to Erika Sasser (sasser.erika@epa.gov)

Re: EPA Information Request Letter to Make Sunsets, Inc.

Dear Ms. Tardif:

We write in response to your letter dated April 14, 2025, to my client, Make Sunsets, Inc., requesting information about their business and operations pursuant to Clean Air Act (CAA) Section 114(a), 42 U.S.C. § 7414(a). We hope that the information provided herein satisfies your request and addresses any concerns that you might have.

EPA's request for information about Make Sunsets' activities is understandable, and we agree with Administrator Zeldin's assertion that the company is currently "unregulated".¹ The Act and its current regulations do not address SO₂ emissions from a weather balloon as either a stationary or a mobile source.² However, Make Sunsets does not dispute that EPA has a strong

¹ ICYMI: Administrator Zeldin in The Hill: "EPA is rejecting the false choice between environmental stewardship and economic prosperity, EPA (May 2, 2025), <https://www.epa.gov/newsreleases/icymi-administrator-zeldin-hill-epa-rejecting-false-choice-between-environmental>.

² The Clean Air Act and its implementing regulations create National Ambient Air Quality Standards (NAAQs) (CAA § 109, 42 U.S.C. § 7409, 40 C.F.R. § 50) and require State Implementation Plans (SIPs) to attain those standards. (CAA § 109, 42 U.S.C. § 7409, 40 C.F.R. § 51). They set ambient air quality standards for sulfur dioxide (SO₂) (40 C.F.R. § 50.4), but that is for the purpose of informing states in the creation and implementation of their SIPs. They set performance standards for new stationary sources (CAA § 111, 42 U.S.C. § 7411, 40 C.F.R. § 60). They set standards for emissions of Hazardous Air Pollutants (HAPs) from a long list of source categories, such as sterilization facilities, cooling towers, and the pulp and paper industry, but SO₂ is not designated as a Hazardous Air Pollutant (CAA § 112, 42 U.S.C. § 7412, 40 C.F.R. § 60.01), and the list of source categories does not include weather balloons (CAA § 112, 42 U.S.C. § 7412, 40 C.F.R. § 63). The Act and its regulations also set engine emission and fuel standards for mobile sources, including "aircraft" (CAA § 221, 42 U.S.C. § 7571, 40 C.F.R. § 87). Even assuming, for present purposes, that a weather balloon qualifies as an "aircraft" – i.e., "a device that is used or intended to be used for flight in the air" (40 C.F.R. § 87, 40 C.F.R. § 1031.205) – it has none of the types of emissions

interest and role in creating a regulatory framework for activities that fall into the category of “solar geoengineering,” and we welcome this opportunity to engage with EPA to ensure that Make Sunsets’ well-intentioned efforts to benefit the environment are made responsibly.

It is clear that solar radiation management is a viable tool to address the warming effects of carbon and other greenhouse gasses in our atmosphere. Indeed, as an EPA Senior Economist explained, it “is an option that would solve most of these problems without the need for alterations in lifestyle” that accompany the alternative, which he referred to as “exclusive regulatory decarbonization.”³ In other words, the kinds of activities in which Make Sunsets engages are a more effective and less expensive way to prevent the adverse effects of greenhouse gasses than the overly-burdensome regulation of carbon emissions that we have relied on until now to the detriment of our energy production and economic security at an annual cost of roughly \$65 billion.⁴ The cooling effect of releasing SO₂ in the stratosphere is well established. The eruption of Mt. Pinatubo in the Philippines in 1991 sent close to 20 million tons of SO₂ into the stratosphere and is credited for dropping global temperatures by approximately one degree for over a year.⁵ When the Hunga Tonga volcano in the South Pacific erupted in 2022, it cooled the southern hemisphere.⁶ On a far smaller scale, Make Sunsets calculates that one gram of SO₂ released into the stratosphere offsets the warming effect of one ton of carbon dioxide for one year.⁷ Solar geoengineering is a critical tool to protect the environment and save American lives, property, national security, and wealth that would greatly benefit from a clear regulatory environment.

The United States has a unique opportunity and responsibility to lead the world in the advancement of this important technology. China revealed plans in 2020 “to drastically expand an experimental weather modification program to cover an area of over 5.5 million square kilometers (2.1 million square miles) – more than 1.5 times the total size of India.”⁸ It was recently reported that the United Kingdom is spending £56.8 million (\$75.5 million) on “21 ‘climate cooling’ projects, which include looking into the logistics of building a ‘sun shade’ in space and injecting plumes of salt water into the sky to reflect sunlight away from Earth.”⁹ The world needs American

regulated by the Act, such as fuel venting (40 C.F.R. § 87.10) and fuel exhaust emissions (40 C.F.R. § 87.20).

³ Alan Carlin, *Risky Gamble*, The Environmental Forum (September/October 2007).

⁴ The Benefits and Costs of the Clean Air Act from 1990 to 2020, U.S. Environmental Protection Agency (April 2011), https://www.epa.gov/sites/default/files/2015-07/documents/fullreport_rev_a.pdf.

⁵ Chris Newhall, James W. Hendley II, and Peter Stauffer, *The Cataclysmic 1991 Eruption of Mount Pinatubo, Philippines*, U.S. Geological Survey Fact Sheet 113-97, <https://pubs.usgs.gov/fs/1997/fs113-97/>.

⁶ Gupta, A.K., Mittal, T., Fauria, K.E. *et al*, *The January 2022 Hunga eruption cooled the southern hemisphere in 2022 and 2023*. Commun. Earth Environ. 6, 240 (2025), <https://doi.org/10.1038/s43247-025-02181-9>.

⁷ Make Sunsets, *Calculating Cooling*, <https://makesunsets.com/blogs/news/calculating-cooling>. See also Andy Parker and David Keith, *What’s the right temperature for the Earth?*, Wash. Post: Opinion (January 29, 2015), https://www.washingtonpost.com/opinions/whats-the-right-temperature-for-the-earth/2015/01/29/b2dda53a-7c05-11e4-84d4-7c896b90abdc_story.html

⁸ James Griffiths, *China to Expand Weather Modification Program to Cover Area Larger than India*, CNN (December 3, 2020), <https://www.cnn.com/2020/12/03/asia/china-weather-modification-cloud-seeding-intl-hnk>.

⁹ Sarah Knapton, *The Secret Government Unit Planning to Dim the Sun*, The Telegraph (May 8, 2025), <https://www.telegraph.co.uk/news/2025/05/08/secretive-quango-dim-sun-fight-global-warming/>.

leadership to develop and deploy this technology in a responsible manner that will protect our physical and economic security while preventing potential harm on a global scale.

With that background, we provide the following information obtained from Make Sunsets in response to EPA's requests: Make Sunsets was founded in 2022 by Luke Iseman and Andrew Song. Its physical address is the one used in your information request, but its founders (and only "employees" used loosely) often work from their homes and from recreational vehicles where they travel. They do not have set "operating hours." The company uses biodegradable latex weather balloons that are approximately five feet in diameter at ground level to release sulfur dioxide (SO₂) (and hydrogen or helium gas for lift) in order to form reflective clouds in the stratosphere in an effort to reflect sunlight and temporarily offset the warming effects of carbon dioxide in the atmosphere.¹⁰ The balloons carry telemetry and GPS devices that provide data about altitude and location. As they ascend, the lighter atmosphere allows the gasses in the balloons to expand until the balloons eventually burst, ideally and most often above 66,000 feet. Once the balloon bursts, the remaining equipment returns to the ground and the latex biodegrades. If a balloon bursts above its target altitude as confirmed by telemetry, Make Sunsets issues what it calls "Cooling Credits." One Cooling Credit is meant to describe offsetting the warming effect of one metric ton of carbon dioxide for a year. If a balloon fails to meet its target altitude or telemetry fails during ascent, Make Sunsets redeploys additional balloons as necessary.

It is important to provide some perspective for Make Sunsets' activities. The company has launched approximately 156 weather balloons containing SO₂, which is a small fraction of the over 500,000 weather balloons that are launched each year.¹¹ More than 97 of Make Sunsets' balloons reached their target altitude.¹² Each balloon contains a rough average of 1.5 kilograms of SO₂. Even if Make Sunsets' activities were regulated by the Clean Air Act, they would fall well below EPA's *de minimus* threshold rate of 100 tons per year for SO₂.¹³ In comparison to Make Sunsets' releases, a single 747 simply landing and taking off emits approximately 3.2 kg of SO₂,¹⁴ and one flight from San Francisco to New York emits between 40 and 90 kg of SO₂.¹⁵ U.S. powerplants

¹⁰ I understand your information request to primarily seek information about Make Sunsets' use of weather balloons containing SO₂, which is the company's primary activity. Make Sunsets experimented last year with three test flights using polyethylene balloons containing hydrogen and a small amount of SO₂. It has also given away small (10 inches or so) latex balloons containing calcium carbonate and hydrogen or helium to children and other members of the public to release at events.

¹¹ See Flight Safety, Overlook Horizons, Inc., <https://overlookhorizon.com/flight-safety/>.

¹² There have been times when altitude sensors on balloons fail before the balloons reach their target altitude. In that case, the balloons likely continue past that altitude, but that is not verifiable. Make Sunsets has been able to verify that approximately 97 of its balloons reached their target altitude.

¹³ See 40 CFR § 93.153(b) and EPA's *de minimus* tables at <https://www.epa.gov/general-conformity/de-minimis-tables>.

¹⁴ Kristin Rypdal, *Background Papers, IPCC Expert Meetings on Good Guidance and Uncertainty Management to National Greenhouse Gas Inventories, Energy, Aircraft Emissions* at p. 69, U.N. Intergovernmental Panel on Climate Change (IPCC), <https://www.ipcc-nggip.iges.or.jp/public/gp/gpg-bgp.html>.

¹⁵ Calculation: A 747 would burn approximately 18,000 gallons (about 54,800 kg) of fuel over five hours. Jet A fuel contains between 400 and 800 ppm sulfur (0.04 to 0.08 %), which would be 22 kg to 44 kg of sulfur in the quantity above. Multiply sulfur by 2 for SO₂ = 44 kg to 88 kg. See E. Kjellstrom, *et al.*, *The Contribution of Aircraft Emissions to the Atmospheric Sulfur Budget* at p. 4, Stockholm University

emitted a total of 650,000 tons (650,000,000 kg) of SO₂ in 2023,¹⁶ and total annual emissions of SO₂ from 51 U.S. airports were estimated to have been 6,525 tons (6,252,000 kg) in 2022.¹⁷

Make Sunsets does comply with applicable laws and regulations. They submit annual reports of their deployments to NOAA as required.¹⁸ They comply with the FAA's regulations for Unmanned Free Balloons (payload less than six pounds, operating away from congested areas, etc.),¹⁹ and they notify the FAA prior to any launch likely to travel near airports, so that the FAA can issue a Notice to Air Missions (NOTAM).²⁰ Their balloons do not carry operating cellphones.²¹ They have been in contact with federal investigative and national security authorities to make them aware of their business and activities.

Make Sunsets does not obtain permits for its balloon launches because they are not required. Your letter requests information about enforcement actions "related to air emissions," and whether federal, state, local, or international authorities have forbidden Make Sunsets from launching balloons. Again in an effort to be transparent, there have been three instances that arguably fall into these categories. In November 2024, the County of Santa Clara Department of Environmental Health ordered Make Sunsets to remove sulfur, sulfur plant fungicide, and helium from a storage unit, which they did. The Berkeley Marina instructed Make Sunsets not to conduct commercial business on its property after Make Sunsets launched a balloon with reporters present. They complied. Mexico apparently "considered" banning solar geoengineering after Make Sunsets released two balloons there in April 2022. Although "[t]he Mexican government told Reuters it is now actively drafting 'new regulations and standards,'" it is not at all clear that it ever actually implemented any ban or regulation that would apply to Make Sunsets' or its activities.²²

We hope that the information provided herein satisfies EPA's April 14, 2025, information request, and please let us know if you need any additional details. Make Sunsets recognizes the need for thoughtful deployment and regulation of solar geoengineering, and it is eager to engage further with EPA on this topic that is so important to our economy and U.S. national security. As patriotic Americans, we have a duty to work together to cool the earth while protecting against

Department of Meteorology, International Meteorological Institute in Stockholm (January 1998), <https://www.osti.gov/etdeweb/servlets/purl/619720>.

¹⁶ *Progress Report – Emissions Reductions*, U.S. Environmental Protection Agency (last updated on September 12, 2024), <https://www.epa.gov/power-sector/progress-report-emissions-reductions#so2>.

¹⁷ *2022 National Emissions Inventory: Aviation Component*, prepared by Eastern Research Group, Inc., for U.S. EPA (April 24, 2024), <https://www.epa.gov/power-sector/progress-report-emissions-reduction#so2https://gaftp.epa.gov/Air/emismod/2022/v1/reports/mobile/airports/Aviation2022%20Documentation%20v4.pdf>.

¹⁸ NOAA Form 17-4A Interim Activity Reports and Final Reports, *see, e.g.* https://library.oarcloud.noaa.gov/noaa_documents.lib/OAR/OWAQ/Weather_Modification_Project/FY24/Q2/2024CASJ-1.pdf;

¹⁹ *See* FAA regulations at 14 CFR 101.31, *et seq.*

²⁰ *See* FAA regulation at 14 CFR 101.37.

²¹ *See* FCC regulation at 47 CFR 22.925.

²² Cassandra Garrison, "Insight: How two weather balloons led Mexico to ban solar engineering," Reuters, March 27, 2023, available at <https://www.reuters.com/business/environment/how-two-weather-balloons-led-mexico-ban-solar-geoengineering-2023-03-27/>.

other potential adverse effects on the environment. Let's ensure American energy dominance as well as a safe and healthy environment by Making Earth Cool Again.

Very truly yours,

E&W Law

A handwritten signature in black ink, appearing to read "John S. Irving", written over a horizontal line.

John S. Irving

A handwritten signature in black ink, appearing to read "E. Donald Elliott", written over a horizontal line.

E. Donald Elliott