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MONTANA FIRST JUDICIAL DISTRICT COURT
LEWIS AND CLARK COUNTY

RIKKI HELD, et al., Plaintiffs, v. STATE OF MONTANA, et al., Defendants.	Cause No. CDV-2020-307 Hon. Kathy Seeley **DECLARATION OF MARK Z. JACOBSON IN SUPPORT OF PLAINTIFFS' RESPONSE BRIEF IN OPPOSITION TO DEFENDANTS' MOTION TO PARTIALLY DISMISS FOR MOOTNESS**

362

Pursuant to MCA §1-6-105, Mark Z. Jacobson hereby declares as follows:

1. I am an expert and rebuttal witness in the above-entitled action. I am making this declaration in support of Plaintiffs' Response Brief in Opposition to Defendants' Motion to Partially Dismiss for Mootness. I have personal knowledge of the facts I state herein, except as to those stated on information and belief, and if called to testify, I would and could testify competently thereto.

QUALIFICATIONS & EXPERT TESTIMONY

2. I have been asked to provide expert testimony in this case about the feasibility of transitioning the State of Montana to 100% clean, renewable energy in all sectors (electricity, transportation, heating/cooling, and industry) by mid-century. Doc. 222, Expert Report.
3. I have also been asked to serve as a rebuttal witness in this case as well to respond to claims and misstatements contained in Dr. Judith Curry's expert report. Doc. 240, Rebuttal Report.
4. I am providing this declaration considering two new developments, specifically the State's repeal of the Energy Policy Act and the issuance of a new IPCC Synthesis Report that supports my conclusions. In both my expert and rebuttal reports, I explicitly reserved the right to supplement the discussion and findings in my expert report if additional relevant or pertinent information became available. Expert Report at 1; Rebuttal Report at 1. This declaration serves as a supplement to my expert reports based on a new Intergovernmental Panel on Climate Change (IPCC) report.
5. Since 1989, I have been researching academically and professionally, the impacts of human emissions of gases (including carbon dioxide and other greenhouse gases) and particles (including black and brown carbon) on air pollution, human health, weather, and climate. Starting in 1999, I began examining in detail clean, renewable energy solutions to these

problems. In 2015, this research culminated in the development of roadmaps to transition the all-sector energy infrastructures of each of the 50 United States to 100% clean, renewable energy by 2050, which I have updated as recently as last year (Jacobson et al., 2022a, which includes a link to the tables used to derive all numbers in the paper). The research has also resulted in the development of 100% clean, renewable energy roadmaps for 139 countries of the world (Jacobson et al., 2017a, which also includes a link to spreadsheets). Those roadmaps were updated in 2019 for 143 countries (Jacobson et al., 2019) and in 2022 for 145 countries (Jacobson et al., 2022b). Grid stability analyses with 100% clean, renewable energy were performed for the 48 contiguous United States in Jacobson et al. (2015b; 2022a), for 20 world regions containing 139 countries in Jacobson et al. (2018), for 24 world regions containing 143 countries in Jacobson et al. (2019), and for 24 world regions containing 145 countries in Jacobson et al. (2022b) assuming those states and countries are converted to 100% clean, renewable energy and storage for all purposes. I have also written a textbook entitled, *100% Clean, Renewable Energy and Storage for Everything*, published by Cambridge University Press in 2020 and another book entitled, *No Miracles Needed: How Today's Technology Can Save Our Climate and Clean Our Air*, also published by Cambridge University Press, in 2023. My full CV is attached to my Expert Report. Expert Report at 1, Attachment 1.

6. In forming my opinions and conclusions in my expert report, I reviewed a substantial number of documents, which are listed in Attachments 2-6 of my expert report. I was also provided information about the State's Energy Policy Act as described in the Plaintiffs' complaint. Expert Report at 14.

THE REPEAL OF THE ENERGY POLICY ACT

7. I have been made aware that the State of Montana repealed the State Energy Policy Act that I referenced once in my expert report when referring to "[p]olicies that promote the increasing development and utilization of fossil fuels . . . ." Expert Report at 14.

8. I do not believe that the repeal of this law affects the conclusions in my expert or rebuttal reports in any way. The Energy Policy Act was referenced in my expert report as an example of the kinds of policies in Montana that promote fossil fuels and result in high levels of greenhouse gas emissions. As described in the Plaintiffs' complaint, Montana engages in other conduct that promotes fossil fuels. Complaint ¶¶ 118-20.

9. Therefore, the conclusions in my report remain valid that "it is technically and economically feasible to transition Montana off of fossil fuels by 2050 and supply its energy needs to 100% WWS [Wind, Water, Solar]" and "that if Montana's policy of promoting fossil fuel development and utilization were declared unconstitutional, WWS would be deployed across Montana on a much larger scale and at a quicker pace." Expert Report at 22.

THE IPCC'S NEW SYNTHESIS REPORT

10. An additional new development is the release of the IPCC's new Synthesis Report of the IPCC Sixth Assessment Report.[1] I have reviewed the *Summary for Policymakers* and it contains several statements that support the opinions contained in both my expert and rebuttal reports:

    - "Several mitigation options, notably solar energy, wind energy, electrification of urban systems, urban green infrastructure, energy efficiency, demand-side management, improved forest- and crop/grassland management, and reduced

[1] Intergovernmental Panel on Climate Change, *Summary for Policymakers, in* Synthesis Report of the IPCC Sixth Assessment Report (AR6) (2023), available at https://www.ipcc.ch/report/ar6/syr/.

food waste and loss, are technically viable, are becoming increasingly cost effective and are generally supported by the public. From 2010-2019 there have been sustained decreases in the unit costs of solar energy (85%), wind energy (55%), and lithium ion batteries (85%), and large increases in their deployment, e.g., >10x for solar and >100x for electric vehicles (EVs), varying widely across regions." IPCC Summary for Policymakers at A.4.2.

- "Climate change is a threat to human well-being and planetary health (*very high confidence*). There is a rapidly closing window of opportunity to secure a livable and sustainable future for all (*very high confidence*)." IPCC Summary for Policymakers at C.1.
- "Deep, rapid, and sustained mitigation and accelerated implementation of adaptation actions in this decade would reduce future losses and damages related to climate change for humans and ecosystems (*very high confidence*). As adaptation options often have long implementation times, accelerated implementation of adaptation in this decade is important to close adaptation gaps (*high confidence*). Comprehensive, effective, and innovative responses integrating adaptation and mitigation can harness synergies and reduce trade-offs between adaptation and mitigation (*high confidence*)." IPCC Summary for Policymakers at C.2.1.
- "Delayed mitigation action will further increase global warming and losses and damages will rise and additional human and natural systems will reach adaptation limits (*high confidence*). Challenges from delayed adaptation and mitigation actions include the risk of cost escalation, lock-in of infrastructure,

stranded assets, and reduced feasibility and effectiveness of adaptation and mitigation options (*high confidence*)." IPCC Summary for Policymakers at C.2.2.

- "Accelerated climate action can also provide co-benefits . . . . Many mitigation actions would have benefits for health through lower air pollution, active mobility (e.g., walking, cycling), and shifts to sustainable healthy diets. Strong, rapid and sustained reductions in methane emissions can limit near-term warming and improve air quality by reducing global surface ozone. (*high confidence*) Adaptation can generate multiple additional benefits such as improving agricultural productivity, innovation, health and wellbeing, food security, livelihood, and biodiversity conservation (*very high confidence*)." IPCC Summary for Policymakers at C.2.3.
- "Feasible, effective, and low-cost options for mitigation and adaptation are already available (*high confidence*)." IPCC Summary for Policymakers at C.3.1.
- "Net zero CO_2 energy systems entail: a substantial reduction in overall fossil fuel use, minimal use of unabated fossil fuels, and use of carbon capture and storage in the remaining fossil fuel systems; electricity systems that emit no net CO_2; widespread electrification; alternative energy carriers in applications less amenable to electrification; energy conservation and efficiency; and greater integration across the energy system (*high confidence*). Large contributions to emissions reductions with costs less than USD 20 $tCO_2\text{-}eq^{-1}$ come from solar and wind energy, energy efficiency improvements, and methane emissions

reductions (coal mining, oil and gas, waste) (*medium confidence*). There are feasible adaptation options that support infrastructure resilience, reliable power systems and efficient water use for existing and new energy generation systems (*very high confidence*). Energy generation diversification (e.g., via wind, solar, small scale hydropower) and demand side management (e.g., storage and energy efficiency improvements) can increase energy reliability and reduce vulnerabilities to climate change (*high confidence*). Climate responsive energy markets, updated design standards on energy assets according to current and projected climate change, smart-grid technologies, robust transmission systems and improved capacity to respond to supply deficits have high feasibility in the medium- to long-term, with mitigation co-benefits (*very high confidence*)." IPCC Summary for Policymakers at C.3.2.

- "Electric vehicles powered by low-GHG emissions electricity have large potential to reduce land-based transport GHG emissions, on a life cycle basis (*high confidence*). Advances in battery technologies could facilitate the electrification of heavy-duty trucks and compliment conventional electric rail systems (*medium confidence*). The environmental footprint of battery production and growing concerns about critical minerals can be addressed by material and supply diversification strategies, energy and material efficiency improvements, and circular material flows (*medium confidence*)." IPCC Summary for Policymakers at C.3.3.

11. In sum, the repeal of the State's Energy Policy Act does not change my conclusions and opinions contained in both my expert and rebuttal reports, and the IPCC's new report bolsters

many of my conclusions and strengthens the case for rapid electrification of all energy sectors in Montana.

Pursuant to MCA §1-6-105, I declare under penalty of perjury and under the laws of the state of Montana that the foregoing is true and correct.

Executed this 8th day of April, 2023 in Stanford, California.

Mark Z. Jacobson