

AMERICAN MEDICAL ASSOCIATION HOUSE OF DELEGATES

Resolution: 438  
(A-22)

Introduced by: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont

Subject: Informing Physicians, Health Care Providers, and the Public of the Health Dangers of Fossil-Fuel Derived Hydrogen

Referred to: Reference Committee D

1 Whereas, Fossil fuel derived hydrogen (H<sub>2</sub>) on a lifecycle basis produces more carbon dioxide  
2 (CO<sub>2</sub>) pollution than methane, despite being portrayed as a “carbon-free” fuel because it does  
3 not produce CO<sub>2</sub> at the point of combustion<sup>1</sup>; and  
4

5 Whereas, Increasing the use of hydrogen as an energy source is being promoted as a way to  
6 reduce carbon emissions (“decarbonize”) and combat climate change;<sup>2 3</sup> and  
7

8 Whereas, The majority (96%) of hydrogen is currently derived from fossil fuels (mostly methane  
9 from natural gas),<sup>4</sup> generating high greenhouse gas (GHG) emissions from both the CO<sub>2</sub>  
10 emitted in producing hydrogen and the upstream methane leaking into the atmosphere during  
11 drilling, production, storage, and transport of natural gas used in producing hydrogen;<sup>5</sup> and  
12

13 Whereas, Current fossil fuel-derived hydrogen production is responsible for CO<sub>2</sub> emissions of  
14 around 830 million tons of CO<sub>2</sub> per year, equivalent to the annual CO<sub>2</sub> emissions of the United  
15 Kingdom and Indonesia combined;<sup>6</sup> and  
16

17 Whereas, Hydrogen ignites more easily and is more explosive than methane,<sup>7</sup> burns at a higher  
18 temperature,<sup>8</sup>; and blends of hydrogen and methane cannot be burned safely in current gas  
19 appliances that have not been retrofitted to handle hydrogen<sup>9</sup>, and  
20

21 Whereas, Burning blends of hydrogen and methane releases substantially more NO<sub>x</sub> than  
22 burning methane gas alone, therefore increasing indoor and outdoor air pollution; burning 100%  
23 hydrogen emits six times more NO<sub>x</sub> than burning natural gas;<sup>10</sup> and  
24

25 Whereas, Capturing and storing the CO<sub>2</sub> generated from fossil fuel derived hydrogen is not  
26 currently a viable option because carbon capture is an energy intensive process and

<sup>1</sup> Howarth, RW, Jacobson, MZ. How green is blue hydrogen? *Energy Sci Eng.* 2021; 00: 1– 12. DOI:[10.1002/ese3.956](https://doi.org/10.1002/ese3.956)

<sup>2</sup> IEA (2019), The Future of Hydrogen, IEA, Paris <https://www.iea.org/reports/the-future-of-hydrogen>

<sup>3</sup> Howarth, RW, Jacobson, MZ. How green is blue hydrogen? *Energy Sci Eng.* 2021; 00: 1– 12. DOI:[10.1002/ese3.956](https://doi.org/10.1002/ese3.956)

<sup>4</sup> International Energy Agency. The Future of Hydrogen, 2019. <https://www.iea.org/reports/the-future-of-hydrogen> Accessed 11/9/21.

<sup>5</sup> Howarth, RW, Jacobson, MZ. How green is blue hydrogen? *Energy Sci Eng.* 2021; 00: 1– 12. DOI:[10.1002/ese3.956](https://doi.org/10.1002/ese3.956)

<sup>6</sup> IEA (2019), The Future of Hydrogen, IEA, Paris <https://www.iea.org/reports/the-future-of-hydrogen>

<sup>7</sup> James Purtil. What is green hydrogen, how is it made and will it be the fuel of the future?

<https://www.abc.net.au/news/science/2021-01-23/green-hydrogen-renewable-energy-climate-emissions-explainer/13081872>

<sup>8</sup> Menzies M. Hydrogen: The Burning Question. *The Chemical Engineer*, 2019

<https://www.thechemicalengineer.com/features/hydrogen-the-burning-question/>

<sup>9</sup> NATURALHY. Using the Existing Natural Gas System for Hydrogen [https://www.fwg-gross-bieberau.de/fileadmin/user\\_upload/Erneuerbare\\_Energie/Naturalhy\\_Brochure.pdf](https://www.fwg-gross-bieberau.de/fileadmin/user_upload/Erneuerbare_Energie/Naturalhy_Brochure.pdf)

<sup>10</sup> Celtek Mehmet Salih & Ali Pınarbaşı, Investigations on Performance and Emission Characteristics of an Industrial Low Swirl Burner While Burning Natural Gas, Methane, Hydrogen Enriched Natural Gas and Hydrogen as Fuels, 43 Int'l J. of Hydrogen Energy 1994-1207. (Jan. 11, 2018), <https://www.sciencedirect.com/science/article/abs/pii/S0360319917319791> .

1 commercial-scale, long-term storage of very large quantities of CO<sub>2</sub> has not yet been proven to  
2 be feasible;<sup>11 12 13</sup> and

3  
4 Whereas, Supporters of natural gas for use in buildings are proposing blending fossil fuel  
5 derived hydrogen with natural gas to reduce CO<sub>2</sub> emissions despite significant risks to human  
6 health and safety;<sup>14 15 16</sup> and

7  
8 Whereas, Hydrogen ignites more easily and is more explosive than methane,<sup>17</sup> burns at a  
9 higher temperature,<sup>18</sup>; and blends of hydrogen and methane cannot be burned safely in current  
10 gas appliances that have not been retrofitted to handle hydrogen<sup>19</sup>; and

11  
12 Whereas, Burning blends of hydrogen and methane releases substantially more NO<sub>x</sub> than  
13 burning methane gas alone, therefore increasing indoor and outdoor air pollution; burning 100%  
14 hydrogen emits six times more NO<sub>x</sub> than burning natural gas;<sup>20</sup> and

15  
16 Whereas, According to the Environmental Protection Agency (EPA), exposures to high  
17 concentrations of nitrogen dioxide (NO<sub>2</sub>) can irritate airways in the human respiratory system  
18 and contribute to the development of or exacerbate respiratory diseases, particularly asthma<sup>21</sup>  
19 <sup>22</sup>, with increased risks for emergency department visits and hospital admissions;<sup>23</sup> and

20  
21 Whereas, 48% of households have natural gas appliances<sup>24</sup> and current natural gas appliances  
22 were not built with technology to reduce the NO<sub>x</sub> produced by burning hydrogen,<sup>25</sup> and

23  
24 Whereas, Blending hydrogen in US natural gas infrastructure could cause increased hydrogen  
25 and methane leakage because hydrogen is particularly corrosive to bare steel and cast iron

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11 Howarth, RW, Jacobson, MZ. How green is blue hydrogen? *Energy Sci Eng.* 2021; 00: 1– 12. DOI:[10.1002/ese3.956](https://doi.org/10.1002/ese3.956)

12 Schlissel D, Wamsted D, Suzanne Mattei S, Mawji O. Reality Check on CO<sub>2</sub> Emissions Capture at Hydrogen-From-Gas Plants; Carbon Capture Essential to Blue Hydrogen Production Has Been Unreliable. Institute for Energy Economics and Financial Analysis. February 2022. [http://ieefa.org/wp-content/uploads/2022/02/Reality-Check-on-CO<sub>2</sub>-Emissions-Capture-at-Hydrogen-From-Gas-Plants\\_February-2022.pdf](http://ieefa.org/wp-content/uploads/2022/02/Reality-Check-on-CO2-Emissions-Capture-at-Hydrogen-From-Gas-Plants_February-2022.pdf)

13 Longden T, Beck FJ, Jotzo F, Andrews R, MoPrasad M. 'Clean' hydrogen? – Comparing the emissions and costs of fossil fuel versus renewable electricity-based hydrogen. *Applied Energy.* 2022;306 Part B: . <https://doi.org/10.1016/j.apenergy.2021.118145>

14 Boston Gas Company d/b/a National Grid, Exhibit NG-FOH-1 1, Hydrogen Implementation Plan, D.P.U. 20-120, November 13, 2020  
<https://fileservice.eea.comacloud.net/FileService.Api/file/FileRoom/12873346>

15 Southern California Gas Company. SoCalGas Among First in the Nation to Test Hydrogen Blending in Real-World Infrastructure and Appliances in Closed Loop System. September 30, 2021. <https://www.prnewswire.com/news-releases/socalgas-among-first-in-the-nation-to-test-hydrogen-blending-in-real-world-infrastructure-and-appliances-in-closed-loop-system-301389186.html>

16 St. John J. Green Hydrogen in Natural Gas Pipelines: Decarbonization Solution or Pipe Dream? Green Tech Media Nov 30, 2020 <https://www.greentechmedia.com/articles/read/green-hydrogen-in-natural-gas-pipelines-decarbonization-solution-or-pipe-dream>

17 James Purtil. What is green hydrogen, how is it made and will it be the fuel of the future? <https://www.abc.net.au/news/science/2021-01-23/green-hydrogen-renewable-energy-climate-emissions-explainer/13081872>

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<https://doi.org/10.1021/acs.est.1c04707>

25 Personal communications with Association of Home Appliances Manufacturers (AHAM).

1 pipes; 28 states have cast iron pipes in their gas infrastructure;<sup>26</sup> there are more than 40,000  
2 miles of bare steel natural gas pipes;<sup>27</sup> and

3  
4 Whereas, Methane, over a 20-year period, is about an 80 times more potent global warming  
5 agent than CO<sub>2</sub>;<sup>28</sup> 30 to 45% of global warming is attributed to methane; and atmospheric  
6 methane has increased dramatically in the last decade;<sup>29 30</sup> and

7  
8 Whereas, The White house Office of Domestic Climate Policy and the Global Methane  
9 Pledge have called for reducing overall methane emissions by 30% below 2020 levels  
10 by 2030, in part because reducing methane in the atmosphere is one of the best ways  
11 to limit global warming;<sup>31 32 33</sup> and

12  
13 Whereas, The oil and gas sector is the largest industrial source of methane emissions in the  
14 United States, responsible for approximately 30% of total methane emissions;<sup>34</sup> and

15  
16 Whereas, Increasing the production of fossil fuel-derived hydrogen to blend with methane in the  
17 natural gas infrastructure will increase the demand for and the production of methane and,  
18 thereby, increase methane emissions and worsen the climate crisis;<sup>35</sup> and

19  
20 Whereas, The Intergovernmental Panel on Climate Change (IPCC) Working Group noted that  
21 “Stabilizing the climate will require strong, rapid, and sustained reductions in greenhouse gas  
22 emissions, and reaching net zero CO<sub>2</sub> emissions. Limiting other greenhouse gases and air  
23 pollutants, especially methane, could have benefits both for health and the climate;”<sup>36</sup> and

24  
25 Whereas, In an unprecedented joint editorial, 200 health and medical journals, including the  
26 New England Journal of Medicine, urged world leaders to cut heat-trapping emissions to avoid  
27 “catastrophic harm to health that will be impossible to reverse;”<sup>37</sup> and

28  
29 Whereas, More than 100 leading public health groups, including the American Medical  
30 Association and the American Academy of Pediatrics; Center for Climate, Health, and the

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<sup>26</sup> Pipeline and Hazardous Materials Safety Administration (PHMSA). Pipeline Replacement Background. March 17, 2020, <https://www.phmsa.dot.gov/data-and-statistics/pipeline-replacement/pipeline-replacement-background>, accessed 01/14/22

<sup>27</sup> PHMSA, Bare Steel Inventory, March 16, 2020. <https://www.phmsa.dot.gov/data-and-statistics/pipeline-replacement/bare-steel-inventory> accessed 01/14/22

<sup>28</sup> Anthropogenic and Natural Radiative Forcing, Chapter 8

[https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5\\_Chapter08\\_FINAL.pdf](https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_Chapter08_FINAL.pdf)

<sup>29</sup> United Nations Environment Programme and Climate and Clean Air Coalition (2021). Global Methane Assessment: Benefits and Costs of Mitigating Methane Emissions. Nairobi: United Nations Environment Programme. ISBN: 978-92-807-3854-4

<sup>30</sup> IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. In Press.

<sup>31</sup> White House Office of Domestic Climate Policy. U.S. Methane Emissions Reduction Action Plan. November 2021.

<https://www.whitehouse.gov/wp-content/uploads/2021/11/US-Methane-Emissions-Reduction-Action-Plan-1.pdf>

<sup>32</sup> Global Methane Pledge <https://www.globalmethanepledge.org>

<sup>33</sup> United Nations Environment Programme and Climate and Clean Air Coalition (2021). Global Methane Assessment: Benefits and Costs of Mitigating Methane Emissions. Nairobi: United Nations Environment Programme. ISBN: 978-92-807-3854-4

<sup>34</sup> EPA. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2019 (Apr. 2021).

<https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2019>.

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<sup>36</sup> IPCC report: ‘Code red’ for human driven global heating, warns UN chief, August 9, 2021

<https://news.un.org/en/story/2021/08/1097362>

<sup>37</sup> Atwoli L, Baqui AH, Benfield T, et al. Call for Emergency Action to Limit Global Temperature Increases, Restore Biodiversity, and Protect Health. N Engl J Med. 2021 Sep 5. DOI: 10.1056/NEJMe2113200. Online ahead of print.

<https://www.nejm.org/doi/10.1056/NEJMe2113200>

1 Global Environment; and the Harvard T.H. Chan School of Public Health agree that the climate  
2 crisis is a health emergency;<sup>38</sup> and  
3

4 Whereas, Ongoing dependence on fossil fuels contributes to the climate crisis which  
5 disproportionately affects low income communities and communities of color; therefore be it  
6

7 RESOLVED, That our American Medical Association recognize the health, safety, and climate  
8 risks of current methods of producing fossil fuel-derived hydrogen and the dangers of adding  
9 hydrogen to natural gas (HP) (New HOD Policy); and be it further  
10

11 RESOLVED, That our AMA educate its members, and, to the extent possible, health care  
12 professionals and the public, about the health, safety, and climate risks of current methods of  
13 producing fossil fuel-derived hydrogen and the dangers of adding hydrogen to natural gas  
14 (Directive to Take Action); and be it further  
15

16 RESOLVED, That our AMA advocate to appropriate government agencies such as the EPA and  
17 the Department of Energy, and federal legislative bodies, regarding the health, safety and  
18 climate risks of current methods of producing fossil fuel derived hydrogen and the dangers of  
19 adding hydrogen to natural gas. (Directive to Take Action)

Fiscal Note: Not yet determined

Received: 05/18/22

## RELEVANT AMA POLICY

### Global Climate Change and Human Health H-135.938

Our AMA:

1. Supports the findings of the Intergovernmental Panel on Climate Change's fourth assessment report and concurs with the scientific consensus that the Earth is undergoing adverse global climate change and that anthropogenic contributions are significant. These climate changes will create conditions that affect public health, with disproportionate impacts on vulnerable populations, including children, the elderly, and the poor.
2. Supports educating the medical community on the potential adverse public health effects of global climate change and incorporating the health implications of climate change into the spectrum of medical education, including topics such as population displacement, heat waves and drought, flooding, infectious and vector-borne diseases, and potable water supplies.
3. (a) Recognizes the importance of physician involvement in policymaking at the state, national, and global level and supports efforts to search for novel, comprehensive, and economically sensitive approaches to mitigating climate change to protect the health of the public; and (b) recognizes that whatever the etiology of global climate change, policymakers should work to reduce human contributions to such changes.
4. Encourages physicians to assist in educating patients and the public on environmentally sustainable practices, and to serve as role models for promoting environmental sustainability.
5. Encourages physicians to work with local and state health departments to strengthen the public health infrastructure to ensure that the global health effects of climate change can be anticipated and responded to more efficiently, and that the AMA's Center for Public Health Preparedness and Disaster Response assist in this effort.
6. Supports epidemiological, translational, clinical and basic science research necessary for evidence-based global climate change policy decisions related to health care and treatment.

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<sup>38</sup> U.S. Call to Action On Climate, Health and Equity: A Policy Action Agenda. List of signatures.  
<https://climatehealthaction.org/cta/climate-health-equity-policy/> Accessed 12/28/19.

Citation: CSAPH Rep. 3, I-08; Reaffirmation A-14; Reaffirmed: CSAPH Rep. 04, A-19; Reaffirmation: I-19

### **EPA and Green House Gas Regulation H-135.934**

1. Our AMA supports the Environmental Protection Agency's authority to promulgate rules to regulate and control green house gas emissions in the United States.

2. Our AMA: (a) strongly supports evidence-based environmental statutes and regulations intended to regulate air and water pollution and to reduce greenhouse gas emissions; and (b) will advocate that environmental health regulations should only be modified or rescinded with scientific justification.

Citation: Res. 925, I-10; Reaffirmed in lieu of Res. 526, A-12; Reaffirmed: Res. 421, A-14; Appended: Res. 523, A-17

### **Climate Change Education Across the Medical Education Continuum H-135.919**

Our AMA: (1) supports teaching on climate change in undergraduate, graduate, and continuing medical education such that trainees and practicing physicians acquire a basic knowledge of the science of climate change, can describe the risks that climate change poses to human health, and counsel patients on how to protect themselves from the health risks posed by climate change; (2) will make available a prototype presentation and lecture notes on the intersection of climate change and health for use in undergraduate, graduate, and continuing medical education; and (3) will communicate this policy to the appropriate accrediting organizations such as the Commission on Osteopathic College Accreditation and the Liaison Committee on Medical Education.

Citation: Res. 302, A-19

### **Stewardship of the Environment H-135.973**

The AMA: (1) encourages physicians to be spokespersons for environmental stewardship, including the discussion of these issues when appropriate with patients; (2) encourages the medical community to cooperate in reducing or recycling waste; (3) encourages physicians and the rest of the medical community to dispose of its medical waste in a safe and properly prescribed manner; (4) supports enhancing the role of physicians and other scientists in environmental education; (5) endorses legislation such as the National Environmental Education Act to increase public understanding of environmental degradation and its prevention; (6) encourages research efforts at ascertaining the physiological and psychological effects of abrupt as well as chronic environmental changes; (7) encourages international exchange of information relating to environmental degradation and the adverse human health effects resulting from environmental degradation; (8) encourages and helps support physicians who participate actively in international planning and development conventions associated with improving the environment; (9) encourages educational programs for worldwide family planning and control of population growth; (10) encourages research and development programs for safer, more effective, and less expensive means of preventing unwanted pregnancy; (11) encourages programs to prevent or reduce the human and environmental health impact from global climate change and environmental degradation. (12) encourages economic development programs for all nations that will be sustainable and yet nondestructive to the environment; (13) encourages physicians and environmental scientists in the United States to continue to incorporate concerns for human health into current environmental research and public policy initiatives; (14) encourages physician educators in medical schools, residency programs, and continuing medical education sessions to devote more attention to environmental health issues; (15) will strengthen its liaison with appropriate environmental health agencies, including the National Institute of Environmental Health Sciences (NIEHS); (16) encourages expanded funding for environmental research by the federal government; and (17) encourages family planning through national and international support.

Citation: CSA Rep. G, I-89; Amended: CLRPD Rep. D, I-92; Amended: CSA Rep. 8, A-03; Reaffirmed in lieu of Res. 417, A-04; Reaffirmed in lieu of Res. 402, A-10; Reaffirmation I-16