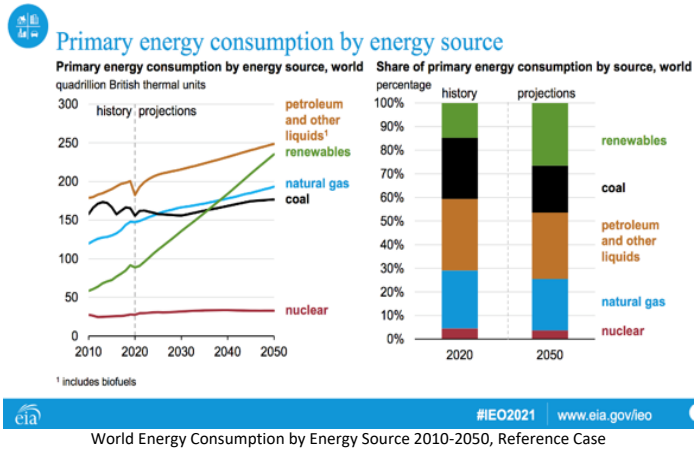
THE GEOLOGICAL SOCIETY OF AMERICA®

GSA Position Statement

GEOSCIENCES AND ENERGY POLICY



World Energy Consumption by Energy Source 2010-2050, Reference Case *(www.eia.gov/outlooks/ ieo/).*

Position Summary. **Development of a comprehensive energy policy that includes approaches for significant reduction of global greenhouse gas emissions is essential for the future economic vitality, environmental well-being, and health and security of the citizens of the United States as well as other nations. Geoscientists locate, quantify, and help develop energy and critical mineral resources required for the transition to a low-carbon future and, along with professionals in other disciplines, assess and mitigate the impact of energy-resource development, operations, and use on the environment. Accordingly, input from geoscientists must be an integral part of all energy policy deliberations.**

This position statement provides a communications tool and summarizes the importance of (1) the geosciences in developing fundamental data, information, and knowledge upon which sound energy policy should be based; and (2) the contributions geoscientists can make to the framing of energy policy. Most energy sources, including fossil fuels, nuclear fuel sources, and renewables have important and distinct geologic components that should be considered when analyzing the life-cycle impacts related to exploration, siting, extraction, development, production, human consumption, waste disposal, recycling, decommissioning, and reclamation of these energy sources.

Conclusions and Recommendations

The Geological Society of America (GSA) supports the collection, use, application, and communication of scientific data, information, and knowledge as critical to public policy and decision making regarding energy resources. Decisions surrounding the development and stewardship of finite energy and related mineral resources have direct bearing on the economic and environmental health of the world and its societies, with important impacts on the reduction of global carbon emissions to help mitigate the effects of climate change.

- **Geoscience expertise—**Geoscientists are essential to discussions about energy policy to ensure that scientific evidence is a foundation to policy formulation and implementation. The geoscience community understands Earth's complex systems, including the timeframes over which geologic processes operate, the capacity of Earth systems to generate different energy resources, and the impact of energy development and use on the environment. Decision makers can connect with geoscientists through organizations and programs such as GSA and other geoscience societies, federal and state geoscience-mission agencies, geoscience departments of colleges and universities, current and past American Association for the Advancement of Science (AAAS) Science and Technology Policy Fellows, and private industry.
- **Adaptation—**State, federal, and global energy policies must be developed in a way that is adaptive to circumstances and innovations and continuously updated to reflect changing conditions. Energy markets are global and dynamic due to emerging technologies, different national and regional economies, the finite nature of nonrenewable resources, the geographic and geologic dependencies for the location of energy resources, and supply disruption potential due to social or political stresses. The continued responsible development of current and emerging energy resources will ensure national energy security and reliable supplies for the future. The skills of geoscientists are well-suited for the transition to a renewable energy economy.
- **Climate Change—**GSA's position statement on climate change recognizes that "human activities (mainly greenhouse-gas emissions) are the dominant cause of rapid warming since the middle 1900s" and "addressing the challenges posed by climate change will require a combination of adaptation to the changes that are likely to occur and mitigation of future impacts through global reductions of CO_2 and other greenhouse gas emissions from anthropogenic sources." GSA encourages the responsible transition away from fossil fuel energy resources, recognizing that a variety of energy sources will be required to meet global energy demand through the transition and that no form of energy is perfectly secure or devoid of potential social, environmental, health, or economic impacts.
- **Research and public investments—**Research on energy sources and the mineral resources required for low-carbon energy technologies, and the environmental, economic, health, and social impacts and benefits of their development, is vital. Continued public investments in geoscience-mission agencies, academic institutions, and public-private partnerships are critical for advancing understanding of the occurrence and formation of energy resources (renewable and non-renewable), assessments of commodity

quantity and quality, optimal siting of renewable energy facilities, impacts of extraction and energy use on land, ground and surface water, air quality and atmosphere, and forecasts of resource availability and environmental impacts.

- **Energy security—**GSA supports national energy security through environmentally, socially, and economically responsible development of energy resources, along with improvements in energy efficiency, conservation, and storage, as the nation transitions to an economy with low greenhouse-gas emissions.

RATIONALE

Geoscientists who work in the petroleum, coal, uranium, mineral, and geothermal industries, engineering geologists, environmental geoscientists, hydrologists, geochemists, oceanographers, meteorologists, and climatologists all play important parts in evaluating and implementing the development of all forms of energy. The geoscience community also assesses the impact of energy development on water resources, ecosystems, air quality, and climate. Geoscientists understand the dynamics of Earth's natural processes and are able to reconstruct climates from the past using atmospheric CO_2 levels and the associated sea level, ecosystem diversity and distribution, and sea-water composition. For those reasons, geoscientists can assess how human activities can influence nature and which activities are environmentally sustainable. Accordingly, geoscientists have an essential role to play in energy policy.

The use of abundant and relatively inexpensive fossil fuels over the past century has contributed to the emergence of the United States as an economic power and has raised the standard of living for much of the developed world. Oil, gas, and coal resources supply fuels for transportation, electric power, and industrial and residential heating. They also provide the energy and basic chemical feedstocks for the manufacture of the steel, plastics, and textiles that support our modern standard of living, and the fertilizers and pesticides needed to feed a growing global population. However, anthropogenic greenhouse-gas emissions, the majority from fossil fuel combustion, have a profound impact on global climate, with adverse effects on local and regional ecosystems and public health. There is a clear policy rationale and a United Nations mandate to reduce global carbon and other greenhouse gas emissions in order to mitigate the impact of climate change.

As the human population currently approaches eight billion and developing and emerging countries transition to consumer-based economies (www.eia.gov/outlooks/ieo/), global demand for energy is predicted to grow significantly through 2050. While the forecasts indicate a significant increase in global fossil fuel consumption, the absolute and proportional increase in renewables (solar, wind, hydro, geothermal, biomass) is dramatic.

The challenge for energy policymakers is to develop a plan that will provide cost-effective improvements for the efficient and sustainable use of Earth's energy resources, provide reliable and affordable energy to the world's developing economies as well as the developed nations of the world, reduce carbon emissions, and accelerate the transition to renewable energy without adversely impacting global standards of living. The knowledge and expertise of geoscientists take on added importance as countries and industries worldwide adapt to climate change and work to reduce carbon emissions.

In its 2020 pamphlet, "Geosciences Supporting a Thriving Society in a Changing World," the American Geosciences Institute stated the importance of energy and the role of the nation's geoscientists as follows:

> *Energy supports economic growth and national security and is essential for all the elements of daily life—food, water, transportation, communication, and entertainment. The United States´ robust and secure energy systems enable our high quality of life. Geoscientists find and develop earth- and ocean-sourced energy resources, such as oil, natural gas, coal, uranium, and geothermal hotspots. They also find and develop the raw materials needed for renewable energy sources: cement and metals for dams, critical metals for wind turbine generators and solar installations, and battery storage metals like lithium and cobalt. In addition, geoscientists help determine appropriate locations for energy infrastructure including refineries, transmission lines, dams, and wind farms.*

Resolution of the energy issues that are presently being debated will have significant economic, strategic, environmental, health, and security consequences. Input from geoscientists is critical to informing the public and policymakers about the consequences of different options.

Adopted October 2017; Revised October 2022

ABOUT THE GEOLOGICAL SOCIETY OF AMERICA

The Geological Society of America unites a diverse community of geoscientists in a common purpose to study the mysteries of our planet (and beyond) and share scientific findings. Members and friends around the world, from academia, government, and industry, participate in GSA meetings, publications, and programs at all career levels, to foster professional excellence. GSA values and supports inclusion through cooperative research, public dialogue on earth issues, science education, and the application of geoscience in the service of humankind.

Opportunities for GSA and its Members to Help Implement Recommendations

To facilitate implementation of the goals of this position statement, the Geological Society of America recommends the following actions:

- GSA members should seek opportunities to effectively communicate the role and importance of geoscientists to society in locating, evaluating, and developing all forms of energy resources and assessing the impact of energy resource development and operations on the natural environment.
- GSA members should make clear to national, state, and local governments, community groups, decision makers, and the public the link between fossil fuel use and climate change, and the importance of reducing carbon and other greenhouse gas emissions by increasing energy efficiency, conservation and storage, and transitioning to low-carbon energy resources.
- GSA members should emphasize the importance of including geoscientists in the process of developing and implementing energy policy, because it is the geoscience community that understands Earth's natural processes, Earth's capacity to produce energy from fossil and renewable resources, and the impact of energy use on the environment.
- GSA members should support continuing education programs and training in new energy technologies to transition geoscientists into the low-carbon energy future

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- Can provide members with readily accessible print, web, and personnel resources that support geoscientists' communications with decision makers regarding the value of the geoscience community in developing energy policy.
- Can raise awareness of the role of geology and government in mineral and energy resources by publishing articles and conducting symposia, technical sessions, and workshops at annual and sectional meetings on these subjects.
- Can help GSA members rise to the challenge of informing the public and decision makers about energy and climate policy by supporting access to objective and reliable energy and climate data.

References and Resources

Energy Statistics

1. United States Energy Information Agency (EIA) International Energy Outlook 2021: http://www.eia.gov/outlooks/ieo/

2. International Energy Agency: https://www.iea.org/data-and-statistics

3. ExxonMobil Updated 2021 Energy & Carbon Summary (April 2021): https://corporate.exxonmobil.com/-/media/Global/Files/energy-and-carbon-summary/Energy-and-carbon-summary.pdf

4. BP Statistical Review of World Energy: https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html

5. International Energy Forum (IEF): https://www.ief

Climate Statements of GSA and Other Scientific Societies

6. GSA Position Statement on Climate Change: http://www.geosociety.org/documents/gsa/positions/pos10_climate.pdf

7. Climate position statement of the American Geophysical Union: https://www.agu.org/-/media/Files/Share-and-Advocate-for-Science/Position-Statements/Society_Must_Address_the_Growing_Climate_Crisis_Now_2019.pdf

8. Climate information statement of the American Meteorological Society: https://www.ametsoc.org/ams/assets/File/aboutams/statements_pdf/AMS_Statement_Climate_Change_April2019.pdf

9. Climate public policy statement of the American Chemical Society: https://www.acs.org/content/dam/acsorg/policy/publicpolicies/sustainability/globalclimatechange/climate-change.pdf

10. AAAS Board statement on climate change: https://www.aaas.org/sites/default/files/s3fs-public/aaas_climate_statement1.pdf

11. Climate scientific statement (Executive Summary) of the Geological Society of London: https://www.geolsoc.org.uk/~/media/shared/documents/policy/Statements/CC%20Statement%20Exec%20Statement.pdf?la=en

Other Relevant Professional Society Documents

12. GSA Position Statement on the Role of Government in Mineral and Energy Resources Research: https://www.geosociety.org/documents/gsa/positions/pos11_GovInEnergy.pdf

13. GSA Position Statement on Critical Minerals and Materials: https://www.geosociety.org/documents/gsa/positions/pos23_CriticalMinerals.pdf

14. American Geosciences Institute (AGI) "Geosciences Supporting a Thriving Society in a Changing World: Energy" (2020): https://www.americangeosciences.org/policy/critical-needs/2020/energy

International Organization Climate Reports

15. CC Climate Change 2021 Summary for Policy Makers: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM_final.pdf

16. Sixth Assessment Report (AR6) of the United Nations Intergovernmental Panel on Climate Change (IPCC): https://www.ipcc.ch/report/ar6/wg1/

17. United Nations Intergovernmental Panel on Climate Change (IPCC) 2014 Synthesis Report: https://www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full.pdf

18. United Nations Paris Agreement on Climate Change: https://treaties.un.org/doc/Treaties/2016/02/20160215%2006-03%20PM/Ch_XXVII-7-d.pdf

Other Climate Information Sources

19. National Academies: https:// www.nationalacademies.org/topics/climate

20. NASA: https://climate.nasa.gov/

21. National Oceanic and Atmospheric Administration: http://www.noaa.gov/climate

22. U.S. Environmental Protection Agency: https://www.epa.gov/climate-change

23. University of Maine Climate Change Institute: https://climatechange.umaine.edu/climate-matters/maines-climate-future/