



**Written Statement Submitted to the United States House of Representatives Committee on Appropriations; Subcommittee on Energy and Water Development Appropriations;**

**Testimony on the FY 2023 Budget Request for the Department of Energy Fossil Energy and Carbon Management Program**

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May 27, 2022

The Gas Turbine Association\* (GTA) appreciates the opportunity to provide the House Committee on Appropriations with our industry's statement concerning recommended FY23 funding levels for the Department of Energy (DOE) Fossil Energy and Carbon Management R&D Program.

GTA is fully supportive of the decarbonization goals that require significant investment with a relevant technology roadmap. GTA understands the global urgency surrounding Energy Security, Energy Equity, and Environmental Sustainability. Our deeply held belief is centered on the long-term value and benefit that gas turbine technology has made and will continue to make in terms of contributing to a balanced and greener energy solution. Our technology, innovative history, and pathway forward are centered on optimizing output, improving thermal efficiency, and achieving environmental friendliness by reducing GHG emissions (with a goal of achieving a zero-carbon impact). We have worked successfully and have commercialized low emissions products since the 1970's. Our investment path has focused on meeting the need for low-cost energy production and ensuring the operating flexibility that is driven by today's changing market demand – gas turbines complement renewable energy systems to ensure grid stability and resiliency. Our fast start/stop capability is unmatched in the market. Gas turbines will contribute significantly to the decarbonization of the energy market.

The GTA strongly believes that DOE R&D funding should be prioritized to improve the performance and carbon footprint of our nation's installed base of power generation infrastructure. Programs that incorporate diversity, equity, and inclusion elements to promote the representation and participation of different groups in the R&D space are an essential investment in underserved communities.

Representing the largest share of current electrical generation across the country, gas turbines provide critically important electrical generation capacity and dispatchability functions that are key to effective and efficient grid operations. These benefits include:

- Firming capacity enabling broader adoption and interconnection of renewable generation facilities,
- Integrating carbon capture and storage solutions, including both pre- and post-combustion carbon capture technologies,

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- Securing energy through reliance on domestic sources of supply to meet our nation’s growing energy needs,
- Meeting social justice energy goals through affordable access.

With this country’s focus on infrastructural improvements, accelerated electrification and US manufacturing, we are entering a period when the U.S. economy will depend more than ever on advanced gas turbine technologies. Gas turbines are used extensively throughout the U.S. for centralized and distributed electrical power generation, as well as industrial applications. Gas turbines can reduce local air pollution, increase energy resilience, lower utility costs and energy burdens, and create good-paying jobs. By advancing energy security and stability, gas turbines can provide increasing support for equality of opportunity and access to energy.

In addition, investing in improved turbine efficiencies as part of a “performance package” paired with carbon-capture technologies can help to operationalize lowest-cost carbon capture solutions. These solutions would in turn provide important elements enabling environmental justice: delivering resilient, clean, affordable power with advanced decarbonized gas turbine technology. This decarbonization may include the existing installed fleet, a significant portion of which is located within communities identified by the EPA as bearing a disproportionate burden of environmental harms and adverse health outcomes.<sup>1</sup> Additionally, reducing the cost of capture promotes adoption, preserving existing jobs and communities while creating new jobs to modernize these vital assets. The gas turbine community looks forward to developing world class technology to ensure US net-zero generation and lead the world in affordable clean power.

As the US National Academy of Sciences has highlighted in a recent report, Advanced Technologies for Gas Turbines: “the gas turbine industry will continue to play a critically important role in the generation of electric power, aircraft propulsion, and the oil and gas industry for decades to come, both domestically and globally.” The GTA therefore strongly believes that advancing gas turbine technology should be a priority for the DOE and our nation in order to keep our economy strong, preserve jobs, and maintain this country’s preeminent position as a global gas turbine technology provider.

Based on input from the National Academies study and other industry stakeholders, the GTA believes that the core element of these programs should include the following:

- 1. Improved Efficiency. Increase combined cycle efficiency to more than 67 percent and simple cycle efficiency to more than 50 percent. This involves both improvements to existing installed power generation facilities as well as development and commercialization of technologies for new generation systems.** Each percentage point increase in efficiency of the U.S. gas turbine power generation fleet results in emissions reductions equivalent to taking 2 million cars off the road, and provides an economic benefit of more than \$7 billion to the U.S. economy.<sup>2</sup>
- 2. Improvements in Fuel Flexibility, enabling gas turbines to operate with high proportions of hydrogen (including pure H<sub>2</sub>) and other renewable gas fuels.** This will make it possible to achieve low to no CO<sub>2</sub> emissions within our existing generation

<sup>1</sup>United States Environmental Protection Agency, “Power Plants and Neighboring Communities”, US EPA Clean Air Markets, Retrieved 05/20/2022, [www.epa.gov/airmarkets/power-plants-and-neighboring-communities#graphing](http://www.epa.gov/airmarkets/power-plants-and-neighboring-communities#graphing)

<sup>2</sup> 10-yr projection with EIA fuel price projections and 1 percentage point efficiency improvement.

base and power production infrastructure. Gas turbines also have a significant role to play in compression and distribution of hydrogen, leveraging existing infrastructure and supporting upgrading of our nation's gas distribution network.

3. ***Compatibility with Renewable Energy Sources delivering resilient, clean and smart grids.*** This will enhance efficiency and operational flexibility by reducing turbine start up times and improving the ability to accommodate flexible power demands inherent in integrating intermittent power sources into the grid while retaining grid stability and enhancing resilience.
4. ***Cutting-edge Technologies – research and development in areas including combustion; heat transfer; high temperature materials including superalloys, coatings, and ceramics paired with improved manufacturability;***
5. ***Technology Demonstration and Validation Capabilities – support component testing, subscale testing, and full-scale testing in existing fleets***

In recent years the Fossil Energy budget has provided \$27 million/year for gas turbine technology R&D. This was increased to \$35 million in FY 2022, however this level is still only a fraction of the funding authorized for this program by Congress in 2020. In the FY 2021 omnibus appropriations bill, the Energy Policy Act of 2020 established a dedicated line item for advanced gas turbine research and development. To build upon this development, **the GTA urges the House to increase gas turbine R&D funding for the Fossil Energy Research and Development (FER&D): High Efficiency Turbines program to \$50 million to match the level authorized in the Energy Act of 2020.**

With natural gas being key to our energy future, the DOE should invest in gas turbine research as part of a broad portfolio to accelerate decarbonization of our economy and robust U.S. manufacturing and job growth. GTA supports enhanced investment in research and development to minority institutions and HBCUs with programs advancing technology in clean energy, energy efficiency and climate programs geared to underserved communities.

Gas turbines produce less than half the CO<sub>2</sub> per megawatt hour than other fossil fuels, and have the ability to integrate hydrogen and other fuels to achieve low or zero-carbon emissions

- Gas turbines are key to stabilizing the electrical grid.
- Gas turbines, with their rapid response capability, are essential for integrating with intermittent renewable energy sources to provide reliable power at all times.
- Gas turbines are a vital part of the growing distributed generation infrastructure.
- Gas turbines are a major manufacturing export sector for the United States – the U.S. exports more than \$10 billion annually in gas turbine systems and components, and has a trade surplus of \$6 billion per year in turbine technologies.

Gas turbines provide a variety of functions essential to the effective, efficient and sustainable operation of America's energy system and our nation's economy. In addition to the attributes outlined above, gas turbines are the primary source of dispatchable power for microgrids across the country (including hospitals, schools, military installations and the US Capitol complex), and underpin critical infrastructure including our nation's natural gas distribution network. In addition, gas turbines ensure the stability and reliability of our nation's electric grid while supporting hundreds of thousands of high-paying jobs in US manufacturing, engineering, operations, repair and related occupations.

The Department of Energy's R&D programs play a very important role in supporting the ongoing competitiveness of American manufacturers in the energy industry. Today's most advanced gas turbines have combined cycle efficiency levels exceeding 61%. In both the United States and other countries, there is a focus on technology advancements towards 65%, and long-term 67%+. In particular, China has identified advanced gas turbines as an industrial sector with critical strategic and economic implications and is devoting vast resources to building its gas turbine manufacturing industry as part of the "Made in China 2025" initiative. Maintaining the competitive edge for the U.S. gas turbine industry is critical to sustaining our manufacturing base and its jobs, producing electricity more efficiently, improving air quality, and increasing exports. An enhanced DOE focus on gas turbine technology R&D funding would lead to improved private/public strategic partnerships which are critical to R&D success and rapid market deployment. Examples of technology advancement areas include the development and integrated testing of: fuel-flexible combustors; turbine components; advanced cooling concepts; advanced aerodynamics; improved materials; and more capable coatings.

In short, advancing gas turbine technology is important to the United States. And increased DOE funding in this strategic area can maximize the potential of every R&D dollar.

*The GTA respectfully requests \$50 million in FY23 appropriations for the Fossil Energy R&D: High Efficiency Turbines Program targeted to advanced gas turbine R&D to meet critical national goals including decarbonization and environmental justice, fuel efficiency to lower the cost of electricity, high-tech jobs, grid stability and reliability, and fuel flexibility, as well as ensuring the US maintains its preeminent position in the global market.*

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