Congress of the United States
Washington, DC 20515

January 14, 2025

Dr. Joseph DeCarolis
Administrator
U.S. Energy Information Administration
1000 Independence Avenue, S.W.
Washington, DC 20585

Dear Dr. DeCarolis,

As the transition to low-carbon energy accelerates, we are writing to express concerns about limitations in "primary energy" use metrics reported by the Energy Information Administration (EIA) and to understand the potential to improve EIA capabilities and reporting standards relating thereto. A clearer, more actionable understanding of the energy system is critical for advancing energy policymaking, strategic planning, resource allocation, technological innovation, and the optimization of current and future energy systems.

We strongly support and utilize existing EIA data. However, the methodologies used by EIA were developed for a fossil-based energy system and are increasingly inaccurate as our economy decarbonizes. We recognize the value of EIA's efforts to update the National Energy Modeling System (NEMS), but current accounting methods still miss important characteristics of renewable and nuclear energy, hindering effective energy planning and policy formulation in this transformative era. Specifically, EIA measures of primary energy rely only on readily-meterable data. For assets that pay for their primary energy (e.g., all assets that use fossil fuels and/or rely on combustion to generate energy), higher-quality – often revenue-grade – meter data is readily available and conversion factors to translate metered physical units (i.e., gallons, scf, tons, etc.) into primary energy (i.e., MMBtu, GJ, etc.) are based on physical laws and agreed fuel specifications. These conditions do not apply to renewable energy sources and nuclear energy where metered data is often non-existent (for renewables), or direct physical conversion factors are limited (for nuclear).

EIA's recent shift from the "fossil fuel equivalency" approach to the "captured energy approach" for quantifying primary energy for non-combustible renewables aligns U.S. practices with international standards and improves international comparability.[1] However, it does not solve the underlying problem, as it still affords no comparability of primary energy use between fossil and non-fossil energy sources.

As noted in a 2023 study in the journal Smart Energy: "due to the inherent energy quality difference of the primary energy of various resources, any indicators that require summing these varying energy quality levels lack a justifiable scientific meaning that enables its comparison."[2] Put more simply, we lack an "apples-to-apples" comparison across all U.S. energy sources, which limits our ability to analyze the data effectively and make fully informed decisions.

[1] Energy Information Administration, *Alternative Measures for the Energy Content of Noncombustible Renewables,* www.eia.gov/totalenergy/data/monthly/pdf/mer_e.pdf
[2] Smart Energy, *The necessity to standardise primary energy quality in achieving a meaningful quantification of related indicators*, November 2023, doi.org/10.1016/j.segy.2023.100115

This can result in obvious misrepresentations of the transition of the US energy system. For example, Lawrence Livermore National Lab's Annual Energy Flow Chart, developed using EIA-defined primary energy data, reports a 2023 estimated US energy consumption of 93.6 Quads, only 3.5% of which reportedly comes from non-combustible renewables (i.e. solar, wind, hydro, and geothermal). [3]

Because of the way the EIA quantifies the US energy system, there are clear data issues, and this problem is only worsening as we decarbonize. The EIA is a critical tool for the public and private sectors to understand our energy system's operation, historical trends, and potential. We must get this right.

Here, for example, are a few areas where consistent, apples-to-apples reporting of primary energy use could facilitate critical insights for policymakers, regulators, utilities, and consumers and allow renewables, nuclear, and fossil-based energy to be evaluated more accurately:

1) <u>Resource utilization and planning:</u> Boosting energy efficiency yields societal benefits regardless of fuel source. For example, a solar array that better converts photons into energy may not save money on fuel but will provide more electricity per unit area which would likely lead to corresponding reductions in silicon and other manufacturing materials. Knowledge of actual conversion efficiencies will facilitate better understanding of future land and material needs for such systems and the attendant environmental consequences from same. Similarly, given expectations of significant repowering needs for the American wind turbine fleet, regulators need to estimate changes in land use for those future investments. Such conclusions unfortunately cannot be inferred from current data with simplistic constant conversion efficiencies.

2) <u>Temporal changes in asset efficiency at rated conditions:</u> Existing historic series from EIA regarding gas use and power generation from gas assets allows one to observe and quantify the emergence of more efficient combined cycle technology. No such historical series are available to evaluate changes in conversion efficiency from wind, solar, hydro, geothermal, or nuclear assets. This makes it impossible to query EIA data series to determine whether those deployed technologies are improving with time and whether in-field operation varies from manufacturer claims in real-world conditions.

3) <u>Temporal changes in asset operation based on changing operating conditions:</u> In addition, changing environmental factors are known to be affecting the operation of renewable asset efficiencies. Changes in wind speeds or river flow rates will cause assets to operate outside of design conditions. Understanding these impacts across the fleet could yield insights that are not presently available from EIA data – but are readily discernible for fossil-fueled assets.

4) <u>Temporal changes in asset operation based on changing operating protocols</u>: Asset efficiency may also be impacted by maintenance and upgrade protocols independent of initial design conditions and exogenous weather events. Examples include the elimination of fixed-axis wind turbines or fixed-angle solar arrays. Understanding how these changes may impact overall asset efficiency is not possible with current EIA reporting protocols – but again, is discernible from those provided for fossil-fueled assets.

5) <u>Untapped nuclear energy quantification:</u> According to the Department of Energy, more than 90% of potential nuclear energy remains in spent fuel.[4] The potential for advanced practices and technological

[3] Lawrence Livermore National Laboratory, *Estimated U.S. Energy Consumption in 2023*, October 2024, flowcharts.llnl.gov/sites/flowcharts/files/2024-12/energy-2023-united-states.png
[4] Department of Energy, Office of Nuclear Energy, *Nuclear Fuel Cycle*, www.energy.gov/ne/nuclear-fuel-cycle

breakthroughs to capture this remaining energy is substantial and should be better understood. For example, France is the only country actively reprocessing its spent fuel to get additional energy from it, achieving up to a 22% increase in derived energy from the original mass of uranium. As a result, 17% of France's electricity is from recycled nuclear fuel.[5] New technologies can also increase energy yield per unit of uranium. The Office of Nuclear Energy has reported that new fuel types, such as TRISO particles, can achieve three times higher burnup than current light-water fuels.[6] None of this opportunity is discernible in EIA reporting, nor can it be discerned from comparisons across IEA data sets since that analysis uses the same fixed-efficiency analysis.

To improve public understanding of the nation's energy system, we respectfully request that EIA:

1) Develop and maintain a system to track, analyze, and report energy data that enables scientifically meaningful and justifiable comparisons across energy sources. If this approach leads to issues that hinder the international comparability of metrics, the EIA should prepare two sets of data. One set should align with international standards, and the differences between each data set should be clearly explained.

2) Coordinate with other agencies and organizations as needed to enhance the quality of data, analysis, and reporting related to the development and maintenance of an improved "primary energy" statistic, particularly in cases where generator-level data is lacking or insufficient. This can be achieved by collaborating with organizations, such as the National Renewable Energy Laboratory, which tracks renewable energy efficiencies, wind and solar resources, and other key data; the Nuclear Energy Office, which tracks nuclear fuel utilization and efficiencies; and the Federal Energy Regulatory Commission, which owns grid-related data.

We recognize that delivering on these requests may involve addressing significant data and operational challenges. To better understand the EIA's approach to these issues, as well as the resources and timeline required, we would appreciate the opportunity to meet in person to discuss it further. We look forward to your insights and to identifying ways to ensure progress on this important effort.

Sincerely,

Sean Casten
Member of Congress

[5] World Nuclear Association, *Nuclear Power in France*, May 21, 2024, world-nuclear.org/information-library/country-profiles/countries-a-f/france

[6] Department of Energy, Office of Nuclear Energy, *TRISO Particles: The Most Robust Nuclear Fuel on Earth*, July 9, 2019, www.energy.gov/ne/articles/triso-particles-most-robust-nuclear-fuel-earth

Kevin Mullin
Member of Congress

Seth Magaziner
Member of Congress

Bill Foster
Member of Congress

Kim Schrier, M.D.
Member of Congress