NREL
Transforming ENERGY

Transforming ENERGY Through Computational Excellence

On the Cutting Edge of Scientific Computing

Scientists and engineers in the National Renewable Energy Laboratory's (NREL's) **Computational Science Center** are deeply embedded in a wide range of scientific investigations, working across theory and experiment to develop groundbreaking, cross-disciplinary data acquisition and analysis, and tying these together with model development.

- Artificial intelligence, machine learning, reinforcement learning, and multidisciplinary deep learning help derive new insights from analysis of very large data sets and guide future research.
- Applied mathematics enables simulations of practical challenges at the scale necessary for actionable insight.
- Visualization and data science leverage high-performance, cloud, and data-centric computing to make sense of data and communicate results.

Computational Methods Underpin Advancement

Across the science and engineering of energy efficiency, sustainable transportation, renewable power technologies, and the knowledge base to optimize energy systems.

- Computational applications develop and solve models of the behavior and control, e.g., materials and chemistry theory, inverse design, and development of digital twins for mobility.
- Energy-efficient operation of on-premises systems in concert with operational research—as a living lab—reduces energy usage within the data center and across the industry.

Join our Team

Using a diverse range of skills, computational scientists are key contributors in materials discovery, process modeling, fluid dynamics, resource mapping, and analysis of large-scale systems with real-time optimization. Researchers leverage cloud, hybrid, and on-premises computing with hardware access at NREL's Energy Systems Integration Facility.

Advance the Science of Computing and Enable NREL's Clean Energy Mission

NREL's computing capabilities will play a critical role in tackling climate and energy challenges by defining paradigm shifts in cyber, climate resilience, environmental justice, and economy-wide modeling. Researchers tackle challenges in abstracted forms that also benefit the broader community with three major objectives:

1. Address fundamental computational science, visualization, and applied mathematics problems in the applied energy space
2. Provide critical support of NREL's mission, from fundamental research in AI to hybrid computing and applied mathematics
3. Perform interdisciplinary research and development in an environment of use, including analysis and control of integrated complex systems in collaboration with colleagues from across disciplines.

View our latest video.

Cover image: Senior Scientist Kenny Gruchalla interacts within a three-dimensional computational fluid dynamics simulation that utilizes particle tracing to depict airflow and temperature from electric vehicle cabin zonal cooling, as part of a cooperative research study with Ford. Visualization by Nicholas Brunhart-Lupo; photo by John De La Rosa, NREL 67185. Back image: Photo by Dennis Schroeder, NREL 26387.

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