
Greetings,

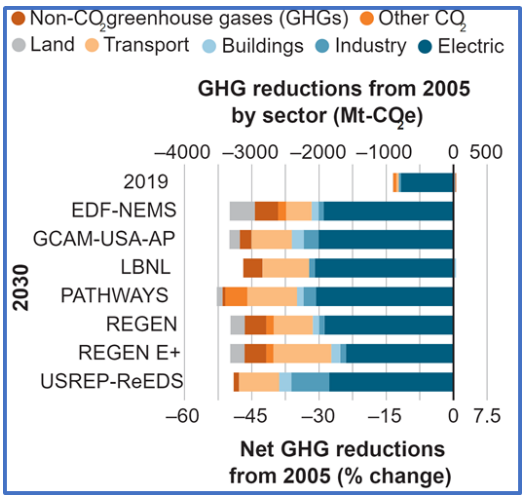
Greetings! We hope you and your family are safe and healthy. We are pleased to offer the newest installment of the Energy Systems and Climate Analysis (ESCA) newsletter.

All announcements included in this email as well as past announcements can be found on the ESCA website.

# ESCA Research Highlights

## Article - Actions for reducing US emissions at least 50% by 2030

A new EPRI-led collaborative article "Actions for Reducing U.S. Emissions at Least 50% by 2030" was published today in the peer-reviewed journal Science. This multi-model comparison with coauthors from seven organizations examines the U.S. climate target to reduce greenhouse gas emissions 50-52% from 2005 levels by 2030 across the electric sector, transport, buildings, and industry.



Key Takeaways:

- The comparison highlights the central role of the power sector in reaching the 2030 climate target, both through direct emissions reductions and through electrification.
- This study emphasizes the rapid speed and scale at which the power sector needs to decarbonize to meet this goal.
- Successfully implementing these strategies will require substantial policy changes coupled with accelerated deployment of electric end-use technologies and of electric sector technologies.

For more information, please contact John Bistline jbistline@epri.com.

READ ARTICLE

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## Perspective – "We Are Wasting Time on These Climate Debates. The Next Steps are Clear"

READ ARTICLE

For more information, please contact John Bistline (jbistline@epri.com).

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## Back Pocket Insight – The Role of the Electric Sector in Net-Zero Emissions Systems

New research reviews insights from emerging studies on net zero emissions systems, including the key roles of the power sector and end use electrification. Understanding net-zero emissions systems is important, given the increasing number of national, subnational, and company net zero targets. This study summarizes similarities and differences in these emerging studies across countries, models, and assumptions.


READ REPORT

Key insights include:

- Decarbonization entails widespread end-use electrification and lowering electricity supply emissions.
- Studies disagree on the rate and extent of electricity load growth implied by net-zero goals – from small increases to quadrupling demand.
- Electrification and the production of electricity-derived fuels (e.g., electrolytic hydrogen) increase demand, which is partially offset by efficiency gains.

For more information, please contact John Bistline (jbistline@epri.com).

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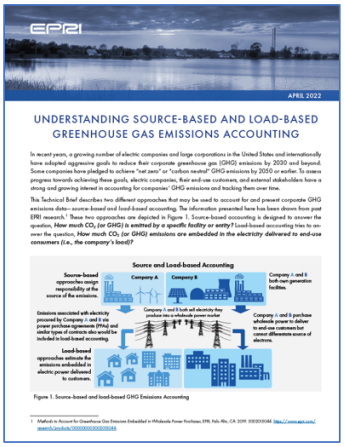
## *New* Resources on GHG Emissions Accounting

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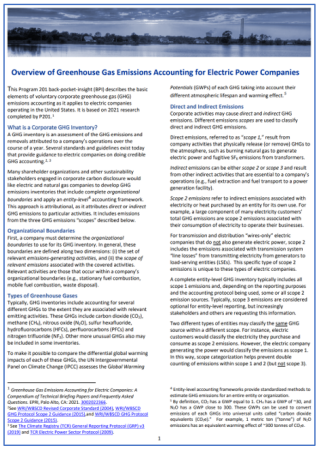


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For more information, please contact Adam Diamant (adiamant@epri.com).

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## Nuclear Energy in Long-Term System Models: A Multi-Model Perspective

NUCLEAR ENERGY IN LONG-TERM SYSTEM MODELS:
A MULTI-MODEL PERSPECTIVE (EXECUTIVE SUMMARY)

Long-term energy system models—including electric sector capacity expansion models—are widely used tools for informing planning, technology assessment, and policy analysis. Recent decarbonization goals and rapid technological change have increased the need to appropriately represent economic characteristics and technical details of energy system resources, including variable renewable energy, energy storage, carbon-capture-equipped capacity, and nuclear energy.

Nuclear power represents about 20% of electricity generation in the United States and 50% of its carbon-free electricity as of 2021. With companies, states, and countries targeting deep decarbonization, many have proposed extending lifetimes of existing nuclear plants and considering new builds. However, there are many perspectives on the role of existing and new nuclear in the future U.S. energy system, which is reflected in the wide range of potential contributions reported in the literature and diverse modeling approaches.

This project aims to understand how issues central to nuclear energy are represented in long-term energy models.[1] It convenes four modeling teams with national-scale long-term energy models to share methods and data, run coordinated scenarios, and identify research needs—extending earlier studies and collaborations on variable renewable energy and energy storage to look at nuclear energy:

- Integrated Planning Model (IPM) from the U.S. Environmental Protection Agency (EPA)
- National Energy Modeling System (NEMS) from the U.S. Energy Information Administration (EIA)
- Regional Energy Deployment System (ReEDS) model from the National Renewable Energy Laboratory (NREL)
- Regional Economy, Greenhouse Gas, and Energy (REGEN) model from the Electric Power Research Institute (EPRI)

Guided by inter-model comparisons and intra-model scenario analyses, we investigate how model structures and input assumptions impact projections. The project also aims to refine model representations of nuclear energy and to communicate findings to the research community and consumers of modeled scenario results. Improving tools can improve the insights they generate.

1 Electric sector and broader energy system models are tools for informing government and private sector decisions, including strategies to meet future electricity and energy needs under a range of policy scenarios, technology options, and market conditions.

This report[2] highlights how models vary in their treatment of key considerations related to nuclear energy and that better understanding these model features and tradeoffs can provide context for interpreting outputs used for resource planning, policymaking, and global analysis. Key assumptions and model features, often glossed over as being too technical, can shape electric sector model outputs, including the potential role of nuclear energy.

**Key Finding: Nuclear energy's role in forward-looking scenarios varies due to differences in scenario assumptions, model structure, and regional characteristics.**

These results point to the important roles that the underlying model structures and input assumptions play in projections for nuclear energy in mitigating climate change and lowering air pollutant emissions.

To understand impacts of different input assumptions and model structures, the study conducted a model intercomparison, where the four participating models ran scenarios with native and harmonized input assumptions across a range of technology and policy futures. The comparison focuses on three policy scenarios:

- **Reference:** On-the-books federal and state policies and incentives.[3]
- **80-by-50:** National electric sector $CO_2$ cap that begins at current levels and linearly decreases to meet 80% emissions reductions by 2050 relative to 2005 levels.
- **100-by-50:** National electric sector $CO_2$ cap that reaches zero emissions by 2050 without negative emissions technologies.

2 Bistline, et al. (2022). Nuclear Energy in Long-Term System Models: A Multi-Model Perspective. EPRI, Palo Alto, CA. 2021. 3002023697.

3 Modeling for this study was completed in 2021 before the Bipartisan Infrastructure Law was passed, which means that the Civil Nuclear Credit Program and incentives for other electric sector resources (e.g., carbon capture, long-duration energy storage, transmission, hydrogen, advanced nuclear) were not included in these scenarios. Scenarios also do not include economy-wide or electric sector targets from the updated April 2021 U.S. Nationally Determined Contribution.

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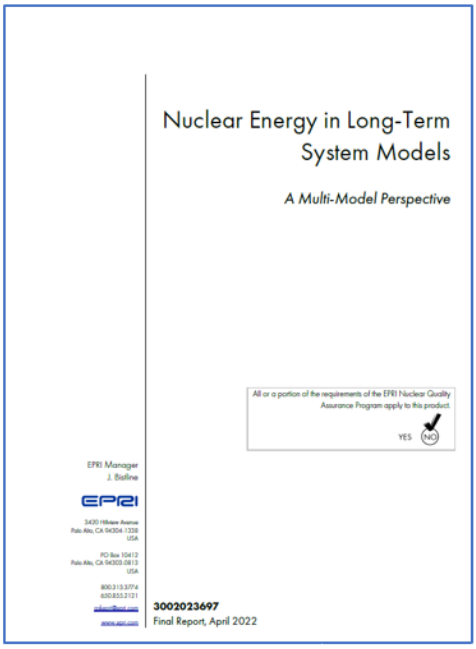

Nuclear Energy in Long-Term System Models

*A Multi-Model Perspective*

All or a portion of the requirements of the EPRI Nuclear Quality Assurance Program apply to this product.

YES (NO)

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3002023697
Final Report, April 2022

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Nuclear power represents about 20% of electricity generation and 50% of carbon-free electricity in the United States as of 2021. However, there are many perspectives on the role of existing and new nuclear in the future U.S. energy system, which is reflected in the broad range of potential contributions reported in the literature.

This study explores how issues central to nuclear energy are represented in long-term energy models. Building on earlier collaborations that focused on variable renewable energy and energy storage, this project convenes four modeling teams that use national-scale long-term energy system models from the Electric Power Research Institute, the National Renewable Energy Laboratory, the U.S. Energy Information Administration, and the U.S. Environmental Protection Agency to share methods and data, update models, run coordinated scenarios, and identify research needs. Improving tools can provide more insightful analyses and ensure that methods are more transparent.

For more information, please contact John Bistline (jbistline@epri.com).

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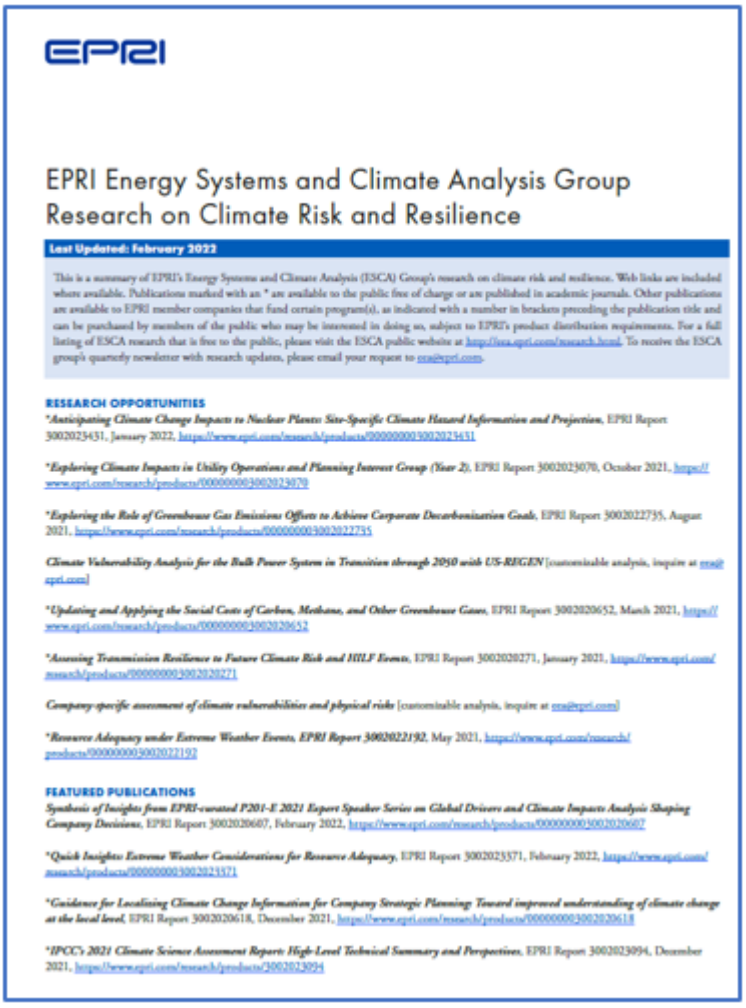
## Research Summary on Climate Risk and Resilience



EPRI

EPRI Energy Systems and Climate Analysis Group
Research on Climate Risk and Resilience

**Last Updated: February 2022**

This is a summary of EPRI's Energy Systems and Climate Analysis (ESCA) Group's research on climate risk and resilience. Web links are included where available. Publications marked with an * are available to the public free of charge or are published in academic journals. Other publications are available to EPRI member companies that fund certain program(s), as indicated with a number in brackets preceding the publication title and can be purchased by members of the public who may be interested in doing so, subject to EPRI's product distribution requirements. For a full listing of ESCA research that is free to the public, please visit the ESCA public website at http://esa.epri.com/research.html. To receive the ESCA group's quarterly newsletter with research updates, please email your request to esa@epri.com.

**RESEARCH OPPORTUNITIES**

**Anticipating Climate Change Impacts to Nuclear Plants: Site-Specific Climate Hazard Information and Projection*, EPRI Report 3002025431, January 2022, https://www.epri.com/research/products/000000003002025431

**Exploring Climate Impacts in Utility Operations and Planning Interest Group (Year 2)*, EPRI Report 3002023070, October 2021, https://www.epri.com/research/products/000000003002023070

**Exploring the Role of Greenhouse Gas Emissions Offsets to Achieve Corporate Decarbonization Goals*, EPRI Report 3002022735, August 2021, https://www.epri.com/research/products/000000003002022735

*Climate Vulnerability Analysis for the Bulk Power System in Transition through 2050 with US-REGEN* [customizable analysis, inquire at esa@epri.com]

**Updating and Applying the Social Costs of Carbon, Methane, and Other Greenhouse Gases*, EPRI Report 3002020652, March 2021, https://www.epri.com/research/products/000000003002020652

**Assessing Transmission Resilience to Future Climate Risk and HILF Events*, EPRI Report 3002020271, January 2021, https://www.epri.com/research/products/000000003002020271

*Company-specific assessment of climate vulnerabilities and physical risks* [customizable analysis, inquire at esa@epri.com]

**Resource Adequacy under Extreme Weather Events, EPRI Report 3002022192*, May 2021, https://www.epri.com/research/products/000000003002022192

**FEATURED PUBLICATIONS**

*Synthesis of Insights from EPRI-curated P201-E 2021 Expert Speaker Series on Global Drivers and Climate Impacts Analysis Shaping Company Decisions*, EPRI Report 3002020607, February 2022, https://www.epri.com/research/products/000000003002020607

**Quick Insights: Extreme Weather Considerations for Resource Adequacy*, EPRI Report 3002025571, February 2022, https://www.epri.com/research/products/000000003002025571

**Guidance for Localizing Climate Change Information for Company Strategic Planning Toward improved understanding of climate change at the local level*, EPRI Report 3002020618, December 2021, https://www.epri.com/research/products/000000003002020618

**IPCC's 2021 Climate Science Assessment Report: High-Level Technical Summary and Perspectives*, EPRI Report 3002023094, December 2021, https://www.epri.com/research/products/3002023094

READ SUMMARY

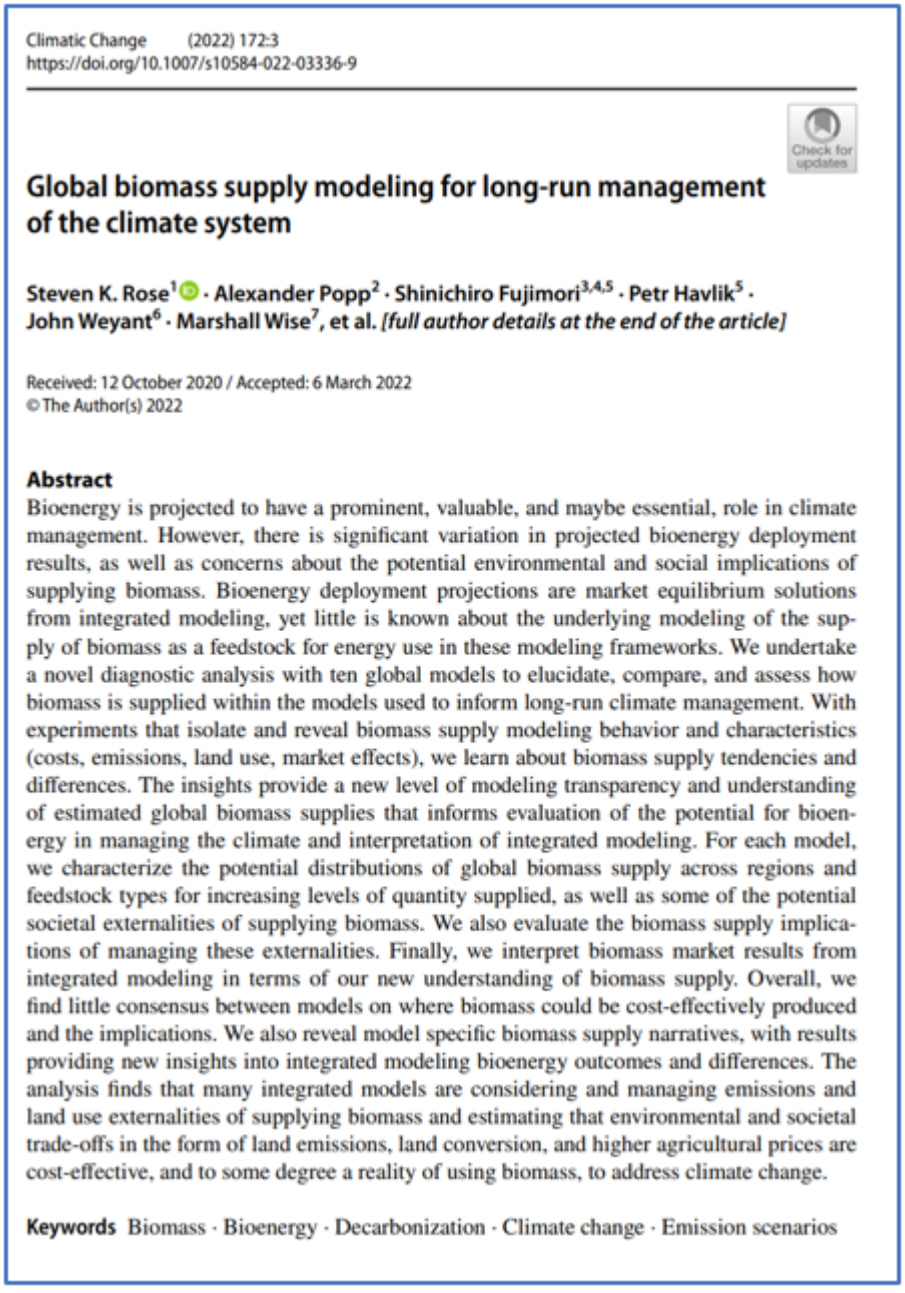
This is a summary of EPRI's Energy Systems and Climate Analysis (ESCA) Group's

research on climate risk and resilience. Web links are included where available. Publications marked with an * are available to the public free of charge or are published in academic journals.

For more information, please contact Delavane Diaz (ddiaz@epri.com).

## Peer-Reviewed Publications

The ESCA group routinely submits publicly available research to peer-reviewed publications. Recent articles include:



Climatic Change (2022) 172:3
https://doi.org/10.1007/s10584-022-03336-9

Check for updates

### Global biomass supply modeling for long-run management of the climate system

Steven K. Rose[1] · Alexander Popp[2] · Shinichiro Fujimori[3,4,5] · Petr Havlik[5] · John Weyant[6] · Marshall Wise[7], et al. *[full author details at the end of the article]*

Received: 12 October 2020 / Accepted: 6 March 2022


**Abstract**
Bioenergy is projected to have a prominent, valuable, and maybe essential, role in climate management. However, there is significant variation in projected bioenergy deployment results, as well as concerns about the potential environmental and social implications of supplying biomass. Bioenergy deployment projections are market equilibrium solutions from integrated modeling, yet little is known about the underlying modeling of the supply of biomass as a feedstock for energy use in these modeling frameworks. We undertake a novel diagnostic analysis with ten global models to elucidate, compare, and assess how biomass is supplied within the models used to inform long-run climate management. With experiments that isolate and reveal biomass supply modeling behavior and characteristics (costs, emissions, land use, market effects), we learn about biomass supply tendencies and differences. The insights provide a new level of modeling transparency and understanding of estimated global biomass supplies that informs evaluation of the potential for bioenergy in managing the climate and interpretation of integrated modeling. For each model, we characterize the potential distributions of global biomass supply across regions and feedstock types for increasing levels of quantity supplied, as well as some of the potential societal externalities of supplying biomass. We also evaluate the biomass supply implications of managing these externalities. Finally, we interpret biomass market results from integrated modeling in terms of our new understanding of biomass supply. Overall, we find little consensus between models on where biomass could be cost-effectively produced and the implications. We also reveal model specific biomass supply narratives, with results providing new insights into integrated modeling bioenergy outcomes and differences. The analysis finds that many integrated models are considering and managing emissions and land use externalities of supplying biomass and estimating that environmental and societal trade-offs in the form of land emissions, land conversion, and higher agricultural prices are cost-effective, and to some degree a reality of using biomass, to address climate change.

**Keywords** Biomass · Bioenergy · Decarbonization · Climate change · Emission scenarios

**Global biomass supply modeling for long-run management of the climate system**

*Climatic Change*

READ PUBLICATION

## Member Center

The ESCA Group conducts its research as part of EPRI Programs 178 (*Resource Planning for Electric Power Systems*) and 201 (*Energy, Environmental, and Climate Policy Analysis*). Examples of recent program-specific research includes:

- Methods to Incorporate Climate Resilience Analysis into Transmission Planning (3002022199) – Project Set 201-E
- Guidance for Localizing Climate Change Information for Company Strategic Planning: Toward improved understanding of climate change at the local level (3002020618) – Project Set 201-E
- Historical Trends and Projected Changes in U.S. Wind and Solar Resources (3002020619) – Project Set 201-E

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For more information about these programs, please contact Nidhi Santen (P178) or David Young (P201).

Thank you for your continued interest in our work. If you have any questions please email eea@epri.com.

Best,
EPRI Energy Systems and Climate Analysis Group