EPRI | ELECTRIC POWER RESEARCH INSTITUTE

ENERGY SYSTEMS AND CLIMATE ANALYSIS GROUP

NEWSLETTER AND RESEARCH HIGHLIGHTS

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. Our website can now be found at http://esca.epri.com.

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

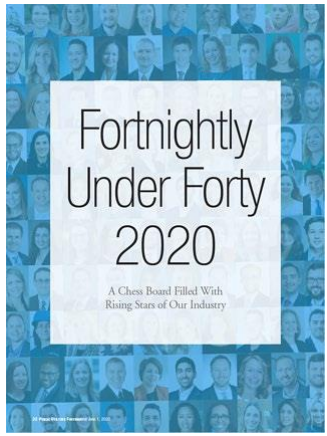
ESCA Staff in the News

PUF Fortnightly Under 40

John Bistline

Delavane Diaz

ESCA researchers, John Bistline and Delavane Diaz, were recently recognized among Public Utilities Fortnightly's "Fortnightly Under Forty 2020".



Read article

Dr. Diaz was also interviewed about her research at EPRI including her work leading analysis of the potential for cost-effective electrification in New York state and development of the Mexico REGEN model that can be used to provide strategic insight on key issues related to clean energy goals and fuel markets.

Encouraging STEM Careers

During times like these, many of us have spent more time with family and some have become instant teachers. While teaching children at home can be challenging, science experiments and other projects have helped keep kids engaged. Learn the story of EPRI Scientist and ESCA researcher, Dr. Nidhi Santen, and find out how she is encouraging children from all backgrounds to get involved in science.

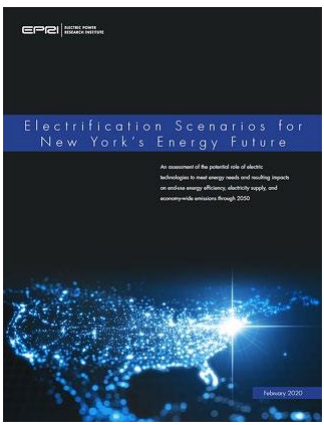
Dr. Santen has always used science as a tool to protect nature and says there is room in science for all types of skill sets. As a way to break barriers & stereotypes in STE(A)M, she has helped create "I am a Scientist" to encourage young students from all over the world. Learn more about the campaign here.

“I Am A Scientist” is designed to encourage the next generation to explore STEM careers. The goal is to ensure that students of all backgrounds and interests can see and connect with the relatable individuals behind groundbreaking scientific innovation.

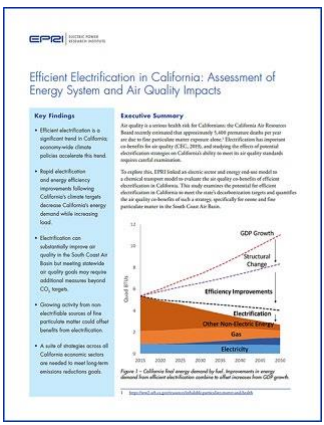
ESCA Research Highlights

Efficient Electrification in U.S. States

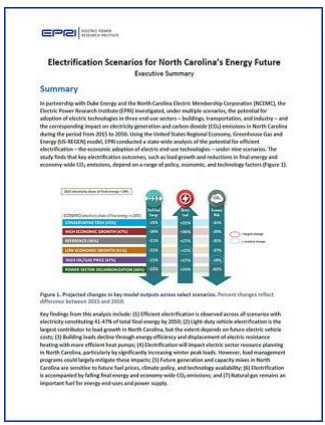
Following the publication of the U.S. National Electrification Assessment, EPRI launched a series of assessments at the state level to evaluate the economic potential for electrification over the next three decades across the buildings, transportation, and industrial sectors. Using EPRI’s US-REGEN model, EPRI evaluated electrification outcomes across a range of state-specific scenarios that varied different policy, market, and technology drivers.



Electrification Scenarios for New York’s Energy Future



Efficient Electrification in California: Assessment of Energy System and Air Quality Impacts

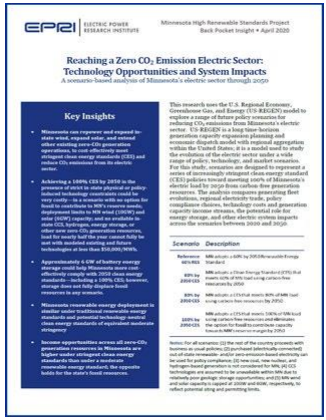


Electrification Scenarios for North Carolina’s Energy Future

Back Pocket Insight—Minnesota High Renewables Standards

Using EPRI's US-REGEN model, this study explores the implications of several future policy scenarios for reducing CO_2 emissions in Minnesota's electric sector. The scenarios are designed to represent a series of increasingly stringent clean energy standard (CES) policies that progress toward meeting 100% of Minnesota's electric load by 2050 from carbon-free generation resources. Key insights from the analysis include:

- Minnesota can repower and expand in-state wind, expand solar, and extend other existing zero-CO2 generation operations to cost-effectively meet stringent CES policies.
- Achieving a 100% CES by 2050 in the presence of strict in-state physical or policy-induced technology constraints could be very costly.
- Battery storage can help Minnesota most cost-effectively comply with a 2050 CES but does not fully displace fossil resources in the scenarios studied.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Minnesota High Renewable Standards Project
Back Pocket Insight • April 2020

Reaching a Zero CO_2 Emission Electric Sector: Technology Opportunities and System Impacts

A scenario-based analysis of Minnesota's electric sector through 2050

Key Insights

- Minnesota can repower and expand in-state wind, expand solar, and extend other existing zero-CO_2 generation operations, to cost-effectively meet stringent clean energy standards (CES) and reduce CO_2 emissions from its electric sector.
- Achieving a 100% CES by 2050 in the presence of strict in-state physical or policy-induced technology constraints could be very costly—in a scenario with no option for fossil to contribute to MN's reserve needs; deployment limits to MN wind (10GW) and solar (6GW) capacity; and no available in-state CCS, hydrogen, energy storage, or other new zero-CO_2 generation resources, load for nearly half the year cannot fully be met with modeled existing and future technologies at less than $50,000/MWh.
- Approximately 6 GW of battery energy storage could help Minnesota more cost-effectively comply with 2050 clean energy standards—including a 100% CES; however, storage does not fully displace fossil resources in any scenario.
- Minnesota renewable energy deployment is similar under traditional renewable energy standards and potential technology-neutral clean energy standards of equivalent moderate stringency
- Income opportunities across all zero-CO_2 generation resources in Minnesota are higher under stringent clean energy standards than under a moderate renewable energy standard; the opposite holds for the state's fossil resources.

This research uses the U.S. Regional Economy, Greenhouse Gas, and Energy (US-REGEN) model to explore a range of future policy scenarios for reducing CO_2 emissions from Minnesota's electric sector. US-REGEN is a long time-horizon generation capacity expansion planning and economic dispatch model with regional aggregation within the United States; it is a model used to study the evolution of the electric sector under a wide range of policy, technology, and market scenarios. For this study, scenarios are designed to represent a series of increasingly stringent clean energy standard (CES) policies toward meeting 100% of Minnesota's electric load by 2050 from carbon-free generation resources. The analysis compares generating fleet evolutions, regional electricity trade, policy compliance choices, technology costs and generation capacity income streams, the potential role for energy storage, and other electric system impacts across the scenarios between 2020 and 2050.

Scenario	Description
Reference 60% RES	MN adopts a 60% by 2050 Renewable Energy Standard
60% by 2050 CES	MN adopts a Clean Energy Standard (CES) that meets 60% of MN load using carbon-free resources by 2050
80% by 2050 CES	MN adopts a CES that meets 80% of MN load using carbon-free resources by 2050
100% by 2050 CES	MN adopts a CES that meets 100% of MN load using carbon-free resources and eliminates the option for fossil to contribute capacity towards MN's reserve margin by 2050

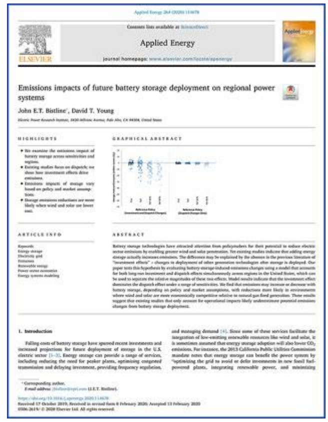
Notes: For all scenarios: (1) the rest of the country proceeds with business as usual policies; (2) purchased (electrically-connected) out-of-state renewable- and/or zero-emission-based electricity can be used for policy compliance; (3) new coal, new nuclear, and hydrogen-based generation is not considered for MN; (4) CCS technologies are assumed to be unavailable within MN due to relatively poor geologic storage opportunities; and (5) MN wind and solar capacity is capped at 10GW and 6GW, respectively, to reflect potential siting and permitting limits.

[Read Back Pocket Insight]

Peer-Reviewed Publications

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


Estimating Power Sector Leakage Risks and Provincial Impacts of Canadian Carbon Pricing

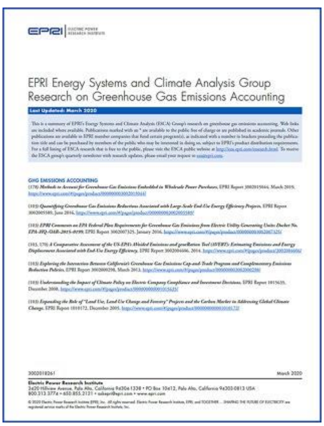

Applied Energy

Emissions impacts of future battery storage deployment on regional power systems

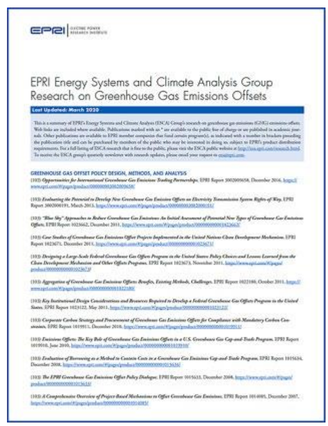
[Estimating Power Sector Leakage Risks and Provincial Impacts of Canadian Carbon Pricing]()

[Emissions Impacts of Future Battery Storage Deployment on Regional Power Systems]()

ESCA Research Summaries—Greenhouse Gas Emissions Offsets and Accounting


EPRI Energy Systems and Climate Analysis Group Research on Greenhouse Gas Emissions Accounting

Last Updated: March 2020


EPRI Energy Systems and Climate Analysis Group Research on Greenhouse Gas Emissions Offsets

Last Updated: March 2020

[Greenhouse Gas Emissions Accounting]()

[Greenhouse Gas Emissions Offsets]()

ESCA maintains a series of research summaries that provide a list of all ESCA research related to a particular topic. Other [research summaries]() are available for **renewable generation**, the economics of **electricity storage**, and the value and costs of **nuclear** generation. 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, as indicated by the program number in brackets preceding the publication. The research summaries are organized by topic and by date and are updated several times a year.

RECAP: 23rd Annual Energy and Climate Research Seminar

Due to the coronavirus (COVID-19) pandemic, EPRI's 23rd annual Energy and Climate Research Seminar was convened as a remote meeting via WebEx. The virtual seminar consisted of three sessions organized around the following topics:

- Session 1: Climate change understanding, including the latest updates to climate modeling and scenarios, public perception of climate change, and climate change communication
- Session 2: Policy outlook on state actions and initiatives
- Session 3: Decarbonization trends focused on transportation, hydrogen, energy storage and solar power and grid integration

Meeting materials including the agenda and presentation slides are available on the ESCA website.

US-REGEN Model Documentation Update

The Electric Power Research Institute (EPRI) maintains an energy-economy model of the United States called the U.S. Regional Economy, Greenhouse Gas, and Energy (US-REGEN) Model. First developed in 2011, the model combines a detailed dispatch and capacity expansion model of the United States electric sector with an economy-wide end-use model disaggregated by sector and activity. This report describes the model, the methodology and theory that underlie it, and the construction of the associated datasets that inform the model. US-REGEN is regularly updated, and features are added to address new research questions. This version of the documentation describes the model's structure as of 2019.

View Model Documentation

Member Center

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

- Analyzing the DeGette Federal Clean Energy Standard Proposal – Project Set 201-B (Webcast)
- System Flexibility Investments and Energy Prices in Regional High Renewable Grids – Project Set 178-B (Report)
- Incorporating Distributed Energy Resources into Resource Planning: Rooftop Solar PV and Electric Vehicles – Project Set 178-B (Webcast)

- Exploring International Greenhouse Gas Reduction Cooperation – Project Set 201-E (Webcast)

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

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