

ABOUT NARUC

- The National Association of Regulatory Utility Commissioners (NARUC) is a non-profit organization founded in 1889.
- Our Members are the state utility regulatory Commissioners in all 50 states & the territories. FERC & FCC Commissioners are also members. NARUC has Associate Members in over 20 other countries.
- NARUC member agencies regulate electricity, natural gas, telecommunications, and water utilities.



THE NARUC CENTER FOR PARTNERSHIPS & INNOVATION

Background & Focus

- NARUC staff dedicated to providing technical assistance to members.
- CPI identifies emerging challenges and connects state commissions with expertise and strategies to inform their decision making.
- CPI builds relationships, develops resources, and delivers trainings.
- All CPI support is federally funded via cooperative agreements with DOE and NIST.



Newly updated CPI fact sheet with recent publications, upcoming events, new member working groups located under Quick Links at: www.naruc.org/cpi

NARUC Center for Partnerships & Innovation
Identifying emerging challenges and connecting state commissions with expertise and strategies to navigate their complex decision-making

The NARUC Center for Partnerships & Innovation (CPI) builds relationships, develops resources, and delivers training to assist state commissions confronting with complex current and emerging issues. CPI is funded by cooperative agreements with the U.S. Department of Energy (DOE) and the U.S. Department of Commerce's National Institute of Standards and Technology (NIST). CPI works across five key areas:

Energy Generation	Energy Transmission	Energy Distribution	Energy Customers
<ul style="list-style-type: none"> Coal & Carbon Management* Nuclear Energy* Natural Gas* Hydrogen Off-Shore Wind Utility-Scale Renewables 	<ul style="list-style-type: none"> Transmission Infrastructure Transmission-Distribution Coordination* Storage Comprehensive Electricity Planning 	<ul style="list-style-type: none"> Integrated Distribution Planning* Grid Modernization Microgrids* Performance-Based Regulation* Virtual Power Plants 	<ul style="list-style-type: none"> DER Integration & Compensation* Demand Flexibility* Electric Vehicles* Stakeholder Engagement Energy Justice

Contact [Kara Zaiman](mailto:kzaiman@naruc.org) Contact [Jeffrey Lober](mailto:jlober@naruc.org)

Integrated System Resilience

Critical Infrastructure Preparedness, Response, and Resilience
<ul style="list-style-type: none"> Cybersecurity for Utility Regulators* Energy Emergency Preparedness Defense Community Partnerships

Contact [Jason Costanti](mailto:jcostanti@naruc.org)

*Contact us to join a members-only group on this topic for regular training and peer exchange opportunities.

Sign up for the [CPI Newsletter](#) for monthly updates about new resources and forthcoming events.

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NARUC CPI is hiring! Please contact us to learn more about exciting new opportunities.

www.naruc.org/cpi | Last updated February 2023

Recent Publications

- Demand Flexibility within a Performance-Based Regulatory Framework** (Feb 2023)
- State Energy Justice Roundtable Series: Customer Affordability and Assistance**
- Participation in Decision-Making** (Energy Justice Memo) (Feb 2023)
- Mini Guide on PUCs and the Investment Community** (Feb 2023)
- Gas Resilience Reference Guide, Chapters 1 & 2** (Jan 6-Feb 2023)
- Updated State Regulatory Pathways to Facilitate Low-Carbon Fuels** (Dec 2022)
- Displacement in Electric Power Systems and Regulation: A Primer** (Dec 2022)
- Unreliability for Electric Vehicles Charging: A Case Study** (Dec 2022)
- Electric Vehicle Interoperability, Considerations for Utility Regulators** (Nov 2022)
- Models for Incorporating Equity in Transportation Electrification** (Nov 2022)
- Mini Guide on Transportation Electrification** (Nov 2022)
- Grid Data Sharing: Brief Summary of Current State Practices** (Nov 2022)
- Regulator's Financial Toolbox Brief: Community Guide for Grid Outages: Electrification: AMIS/DERMS** (Oct 2022)
- Defense Energy Resilience Resources Guide & PAF for Commissioners** (Oct 2022)
- Workforce Development Toolbox: Recruitment Templates and Social Media Engagement Materials** (Sept 2022)

Forthcoming Publications

- Black Sky Playbook
- Energy Resilience Reference Guide Chapter 3: Climate Resilience
- State Microgrid Policy, Programmatic, and Regulatory Framework
- Renewable Energy Microgrids
- Considerations of Advanced Nuclear in Resource Planning

Upcoming Virtual Learning Opportunities

- Modern DER Capabilities and Deployment**, March 8: Next in the virtual interconnection workshop series, NREL will address PUC questions on DER technical capabilities, deployment concerns, and benefits. [Contact Jeff](#)
- Resilience for Regulators Webinar Series**, March 9: Climate informed mitigation strategies. [Visit past presentations](#) on critical infrastructure resilience, climate resilience, defense energy resilience, and more. [Contact William](#)
- Monthly Innovation Webinars**, March 16: Advances in Resource Adequacy. [Register | past recording](#). [Contact Jessica](#)
- On Demand**, Video-Based Learning Modules, Dozens of training videos in English and Spanish on [electricity system planning](#), [distribution systems](#), and [planning](#), [smart grid](#) and [EV interoperability](#). [Contact Danielle](#)

Upcoming in Person Events Travel stipends available

- Cybersecurity Training**, Indianapolis, IN, March 22-24: Experts will provide content on cybersecurity topics through the lens of utility regulators with presentations, engaging activities, and more. (Commissioners and staff) [Contact Lynn](#)
- Nuclear Energy Partnership Pacific Northwest National Lab Site Visit**, April 25-28: Tour PNL and NW nuclear sites. Advanced Nuclear State Collaborative kickoff workshop will also take place. (Commissioners and staff) [Contact Kara](#)
- Natural Gas Partnership Site Visit**, Savannah, GA, May 2023: Tour the Elba Island liquefied natural gas export facility. Part of Savannah compressed natural gas fueling station, and more. (Commissioners only) [Contact Kara](#)
- More Info Available Soon**: Energy Justice Midwest Regional Workshop (early May), Grid Data Sharing Collaborative Demonstration Workshop (mid-May) in Washington, DC, Resilience Planning Regional Workshops [Contact Danielle](#)

Join a Member Working Group for Commissioners and Commission Staff

- Integrated Distribution System Planning**, [Register](#), for presentations by subject matter experts and commissions followed by questions and facilitated discussions among members. Six sessions: Feb 27 - Jun 12. [Contact Kara](#)
- NARUC-NASRO Advanced Nuclear State Collaborative**, Exchange questions, needs, and challenges relating to the planning and deployment of new advanced nuclear generation. [Contact Kara](#)
- NARUC-NASRO Microgrids State Working Group**, Explore capabilities, costs, benefits, and development strategies for microgrids with PUCs and State Energy Offices. [Contact Kara](#)
- Electric Vehicles State Working Group**, Learn and discuss regulatory questions around transportation electrification, including charging infrastructure buildout, rate design, equity considerations, V2G, and more. [Contact Danielle](#)
- Performance-Based Regulation State Working Group**, Examine approaches to performance-based regulation and alternative ratemaking across states in a collaborative peer group setting. [Contact Elliot](#)
- UX Working Groups**, DOE/National Lab effort for commissions and stakeholders to identify grid interconnection challenges and discuss solutions. [Contact Jeff](#)
- Workforce Development Peer Advisory Group**, Supporting recruitment & retention for commissions. [Contact Leah](#)

www.naruc.org/cpi | Last updated February 2023



MODERATOR

**COMMISSIONER DIANE BURMAN, NEW YORK STATE PUBLIC SERVICE
COMMISSION
NORA MEAD BROWNELL, ESPY ENERGY SOLUTIONS**

Speakers:

**ELIZABETH COOK, DUQUESNE LIGHT COMPANY
SEAN REMINGTON, EVERSOURCE
JEREMY RENSHAW, EPRI
GREG SHANNON, IDAHO NATIONAL LABORATORY**

ChatGPT on climate change and utilities



ChatGPT on climate change and utilities

In 50 words or less, with bullets, which U.S. utilities are most vulnerable to threats due to climate change?



ChatGPT on climate change and utilities

In 50 words or less, with bullets, which U.S. utilities are most vulnerable to threats due to climate change?

- Coastal utilities
- Utilities in drought-prone regions
- Utilities dependent on snowpack
- Utilities in wildfire-prone regions
- Aging infrastructure
- Fossil fuel-dependent utilities



ChatGPT on climate change and utilities

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In 50 words or less, with bullets, which U.S. utilities are least vulnerable to threats due to climate change?

- Geographically diversified utilities
- Renewable energy-focused utilities
- Well-maintained and modernized infrastructure
- Utilities with diverse energy portfolios
- Utilities with proactive adaptation strategies



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Geographically diversified utilities

Renewable energy-focused utilities

Well-maintained and modernized infrastructure

Utilities with diverse energy portfolios

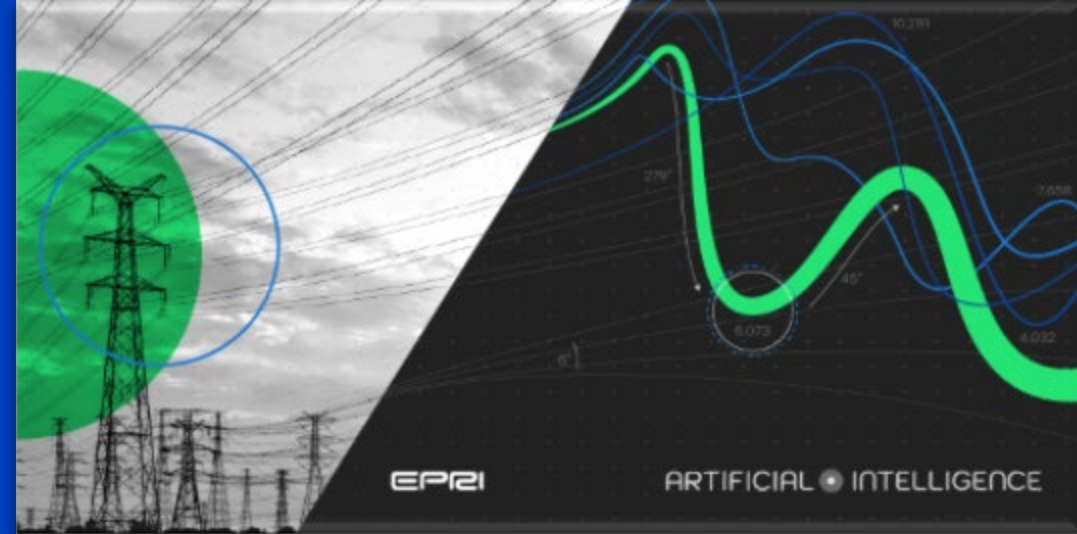
Utilities with proactive adaptation strategies



Exercises for the Reader:

Which specific U.S. utility companies are most vulnerable to threats from climate change?

Which specific U.S. utility companies are least vulnerable to threats from climate change?



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Building an AI-Electric Power Community

Visit: www.AI.EPRI.com

Email: ai@epri.com

Collecting, Curating and Sharing Data,
and Developing Solutions

Deepening AI Expertise in the Electric Power
Industry

Multi Spectral Satellite Data for Environmental and Vegetation Related Use Cases

Objectives and Scope

- Understand cost structure and data sharing agreements for acquisition and curation of satellite imagery
- Create repository for useful data layers from same geospatial regions (Utility GIS, Vegetation, Terrain etc.)
- Evaluate and document most valuable use-cases for the electric power industry

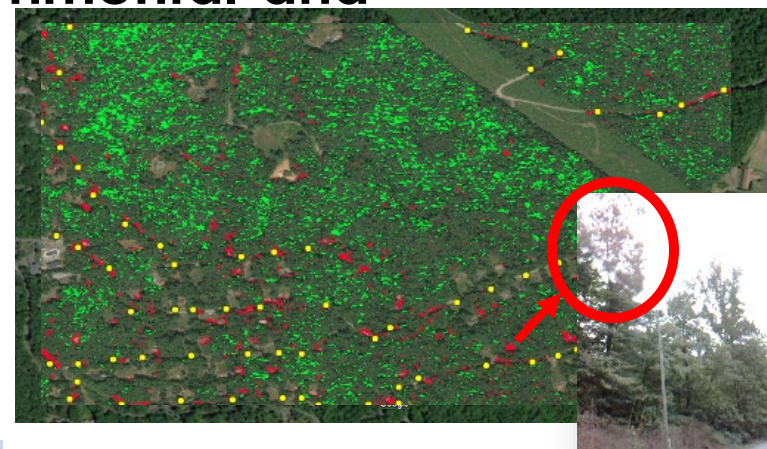
Potential Impacts

- Enhanced risk model for power industry
- Industry repository to collaborate on value cases

Value

- Reduce costs for vegetation management
- Identify and remediate outage risks in advance

Data Set	Vegetation Imagery
AI Approach	Change Detection and Supervised Learning



High Level Milestones for Project

- *Document costs to acquire historical and on demand multispectral imagery*
- *Document the contractual data usage rights and data sharing options for the imagery*
- *Create a researcher accessible repository of relevant data layers leveraging the EPRI datahub*
- *Create video style readme files to familiarize researchers with the data and its structure*
- *Identify key value cases for follow-on opportunities*

Multi-Spectral Satellite Data Can Support Dozens of Industry Use Cases

Reinforcement Learning for Real Time Operations

L2RPN

Objectives and Scope

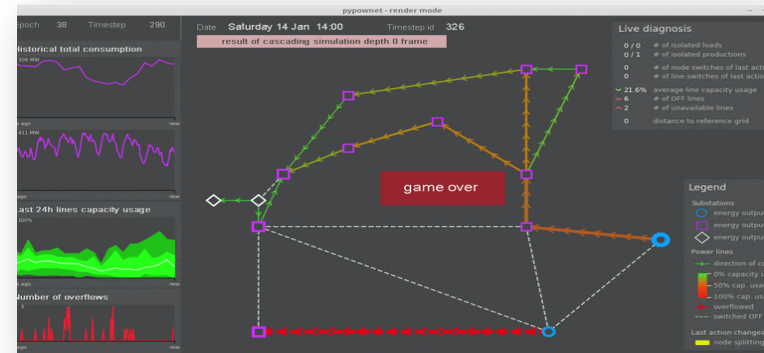
- Use reinforcement learning-based challenges to engage AI/ML/RL vendors and scientists and foster a community of researchers to develop a **control center digital assistant**.
- The digital assistant works in parallel to the grid operator, guiding decision making or autonomously controlling the grid. The digital assistant is trusted, flagging its confidence and encouraging manual intervention if required.
- Develop a standard framework for all AI uses cases (within and without EPRI) and data baselines in transmission network operations

Value

- Near Term** – Position EPRI as the go-to entity for using reinforcement learning in electricity system use cases.
 - Make epri.com/L2RPN the go-to site for AI based challenges generally
- Long Term** – By collaborating with world leading experts and vendors and incentivizing innovations through competition, become the first entity to develop a functioning digital assistant for a control center.
 - Optimizes the control of the power grid and saves in redispatch costs, improves efficiencies and ultimately reliability and security of supply to customers.

Project Milestones and Status

- 2021-22: two challenges**
 - Summer ICAPS conference “Trusted AI in the Control Room”**
 - Improvement to L2RPN as point of entry for L2RPN**
 - Future: L2RPN on a real network (potentially Ireland)**



Data Sets	AI Approaches
<p>Now: Synthetic data created from synthetic model of a grid.</p> <p>Later: A model of small real network in an island (potentially Ireland) with realistic demand and generation data</p>	<ul style="list-style-type: none">Reinforcement learning

AI for Smart Generation Dispatch Optimization

Objectives and Scope

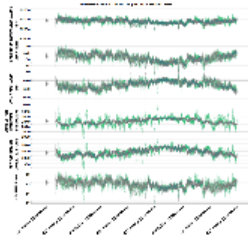
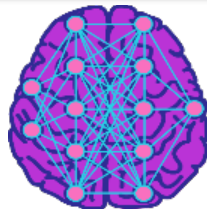
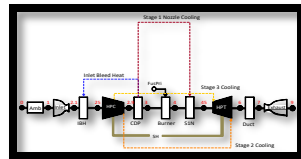
- Help optimize plant dispatch based on performance, reliability, and availability
- Leveraging our prior digital twin work combining AI and physics-based approaches
- Enable forecasting of monthly and annual performance including seasonal variations
- Determine the optimal operation for multiple assets at fleet/site under current site conditions

Potential Impact

- Providing greater insight into unit condition and operations real-time
- Better informed decision making for multi-unit dispatch
- Enable reliable generation forecasting

Value

- Increase precision of dispatch and planning
- Fast comparison of multi-objective availability of different units



Digital
Twin



Machine
Learning



Predicted
Asset
Specific
Capability

Data Set	<ul style="list-style-type: none"> O&M data relating to 30 years around gas turbines
AI Approach	<ul style="list-style-type: none"> Multi-layer perceptron neural networks, Bayesian Inference, Replication of physics-based models using neural network

How to Get Involved

- Visit www.ai.epri.com for details
- Email ai@epri.com to reach out
- Collaborate and **Share Data**
- [Sign up for the AI.EPRI monthly newsletter](#)



Driving AI solutions with clear benefits

EPRI is convening the collective capability of electric power and artificial intelligence (AI) experts to create game-changing yet practical solutions for tomorrow's energy network. Our work in AI goes back decades, and we're building on this legacy. We're creating an Electric Power-AI community, creating solutions and delivering results.

Available resources

AI.EPRI.com

This is EPRI's main hub for AI-related news and information. Visit AI.epri.com to learn about EPRI's AI research and collaborations, read industry news and connect with our team.



AI.EPRI news

Subscribe to AI.EPRI's monthly newsletter for the latest news on recent projects, the latest technologies and industry innovations, use cases, and upcoming events and activities. [SIGN UP HERE](#) or contact us at AI@epri.com.



EPRI10 data sets

AI.EPRI is focused on addressing challenges that can be solved with AI technologies. We've established the EPRI10, a collection of high value data sets, to act as the fundamental inputs to accelerate the industry's use of AI and data to transform operations. Learn about the data sets [HERE](#).



AI R&D and projects

EPRI has a number of AI and data science projects focused on asset management, decarbonization, smart grid, inspections, human performance, predictive analytics, natural language processing, image recognition, foundational work and much more. Learn more [HERE](#).



Data Analytics Training

EPRI's Grid-Ready Energy Analytics Training (GREAT) initiative is developing training for electric utility workers. Funded in part by the U.S. Department of Energy, GREAT strives to deliver training that addresses intersecting issues for Grid Operations technology and IT. Visit the [website](#).



AI for EnvDataSci

EPRI, acting as a conduit between data science and electric power industry stakeholders, is collaboratively expanding the effective use of data science solutions for environmental impact challenges. To learn more, visit our [Environmental Data Science page](#).



[Join us](#) to be an AI catalyst for tomorrow's energy network.

"AI is one of the most profound things we're working on as humanity. It's more profound than fire or electricity."

Pichai, Sundar. (2020). "Why Google thinks we need to regulate AI". The Financial Times.

"I think we should be very careful about artificial intelligence. If I were to guess like what our biggest existential threat is, it's probably that. So we need to be very careful with the artificial intelligence."

Musk, Elon. (2014). "Elon Musk: Artificial intelligence is our biggest existential threat". MIT AeroAstro Centennial Symposium.

Generative AI is a subset of AI that includes methods capable of creating something new. It's been used to generate music, images, and text that can often be indistinguishable from content created by humans.

Source: [Goodfellow, I., Bengio, Y., & Courville, A. \(2016\). Deep Learning. MIT Press.](#)



- Data Loss
- Malicious Code/Systems
- Plagiarism
- Disruption due to Automation
- Misinformation
- Deep Fakes



- Balancing the benefits and risks of generative AI
 - More data risk vs more efficiency
 - Increased innovation
 - Increased cost savings
- The impact on jobs and the skills needed for the future
 - Will impact most jobs, eliminating the need for dedicated resources in others
- Preparing your organization for the adoption of generative AI
 - Clear policy around AI
 - Training and Awareness of Generative AI
 - Establish SME(s) and Committees for AI to stay on top of new trends, products and developments.

AI (MACHINE LEARNING) SECURITY PERSPECTIVES

- Positive
 - Gives analysts superpowers
 - Gives operators access to best practices
- Neutral
 - Everyone has regulatory expertise
 - Can write computer code, scripts
- Negative
 - Data quality matters
 - Useful for deception





NARUC Innovation Webinar Series

One webinar most months

All NARUC members and stakeholders are invited

Topic: Community Solar

July 27, 2023 | 3:00 – 4:00 PM EST

Topic TBD

August 17, 2023 | 3:00 – 4:00 PM EST

More webinar information will be added soon!

<https://www.naruc.org/cpi-1/innovation-webinars/>