INITIATIVE ON CYBERSECURITY IN SOLAR PROJECTS: CYBERSECURITY ADVISORY TEAM FOR STATE SOLAR (CATSS)

NARUC CENTER FOR PARTNERSHIPS & INNOVATION

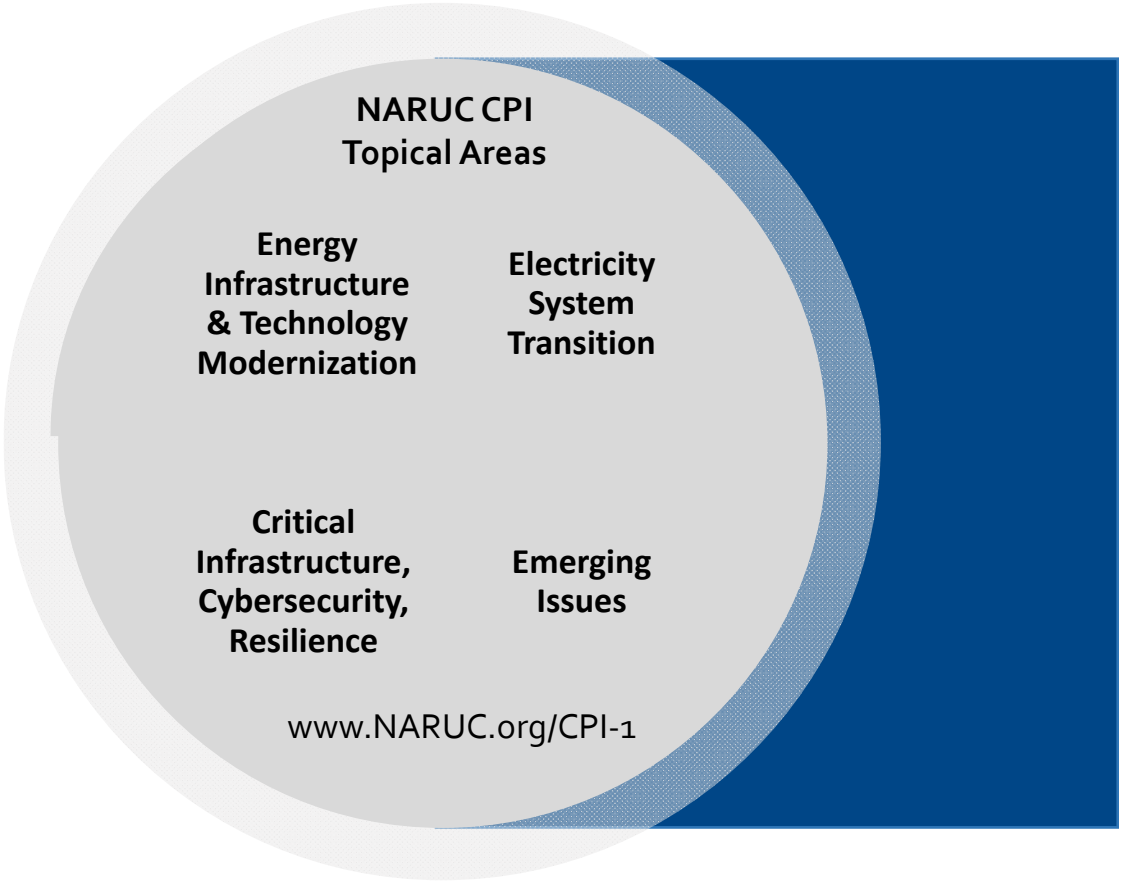
APRIL 15, 2021

WHAT IS NARUC

- The National Association of Regulatory Utility Commissioners (NARUC) is a non-profit organization founded in 1889.
- Our Members are the state 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.

WHAT IS NARUC'S CENTER FOR PARTNERSHIPS AND INNOVATION?

- Grant-funded team dedicated to providing technical assistance to members.
- CPI identifies emerging challenges and connects state commissions with expertise and strategies.
- CPI builds relationships, develops resources, and delivers trainings.



Today's Speakers

Jeremiah Miller, PE
Systems Integration Technology Manager
Solar Energy Technologies Office U.S. Department of Energy

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Senior Program Director, Electricity
National Association of State Energy Officials (NASEO)

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Emerging Cybersecurity Challenges for Rooftop Solar

NASEO/NARUC CATSS Workshop

Jeremiah Miller, PE
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Disclaimer

- The presentation and associated discussion are my personal thoughts and ideas.

- These views are not represented as those of the U.S. Government, or the Department of Energy, or the Solar Energy Technologies Office.

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Solar Energy Technologies Office

WHAT WE DO

The Solar Energy Technologies Office funds early-stage research and development in three technology areas: photovoltaics, concentrating solar power, and systems integration with the goal of improving the **affordability**, **reliability**, and **performance** of solar technologies on the grid.

HOW WE DO IT

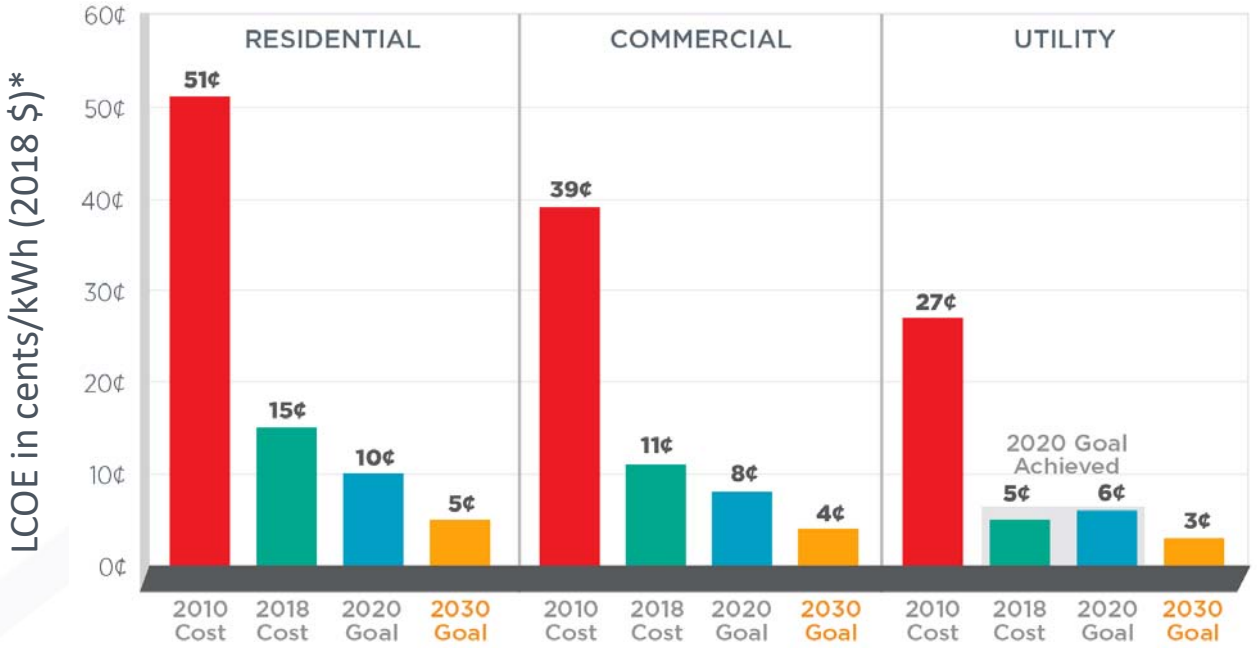
Cutting-edge **technology development** that drives U.S. leadership and supports a growing and skilled workforce.

Research and development to **address integration of solar** to the nation's electricity grid.

Relevant and objective technical information on solar technologies to stakeholders and decision-makers.

Progress and Goals: 2030 Solar PV Goals

The office invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use and storage of solar energy, and lower solar electricity costs.



*Levelized cost of energy (LCOE) progress and targets are calculated based on average U.S. climate and without the ITC or state/local incentives. The residential and commercial goals have been adjusted for inflation from 2010-18.

energy.gov/solar-office

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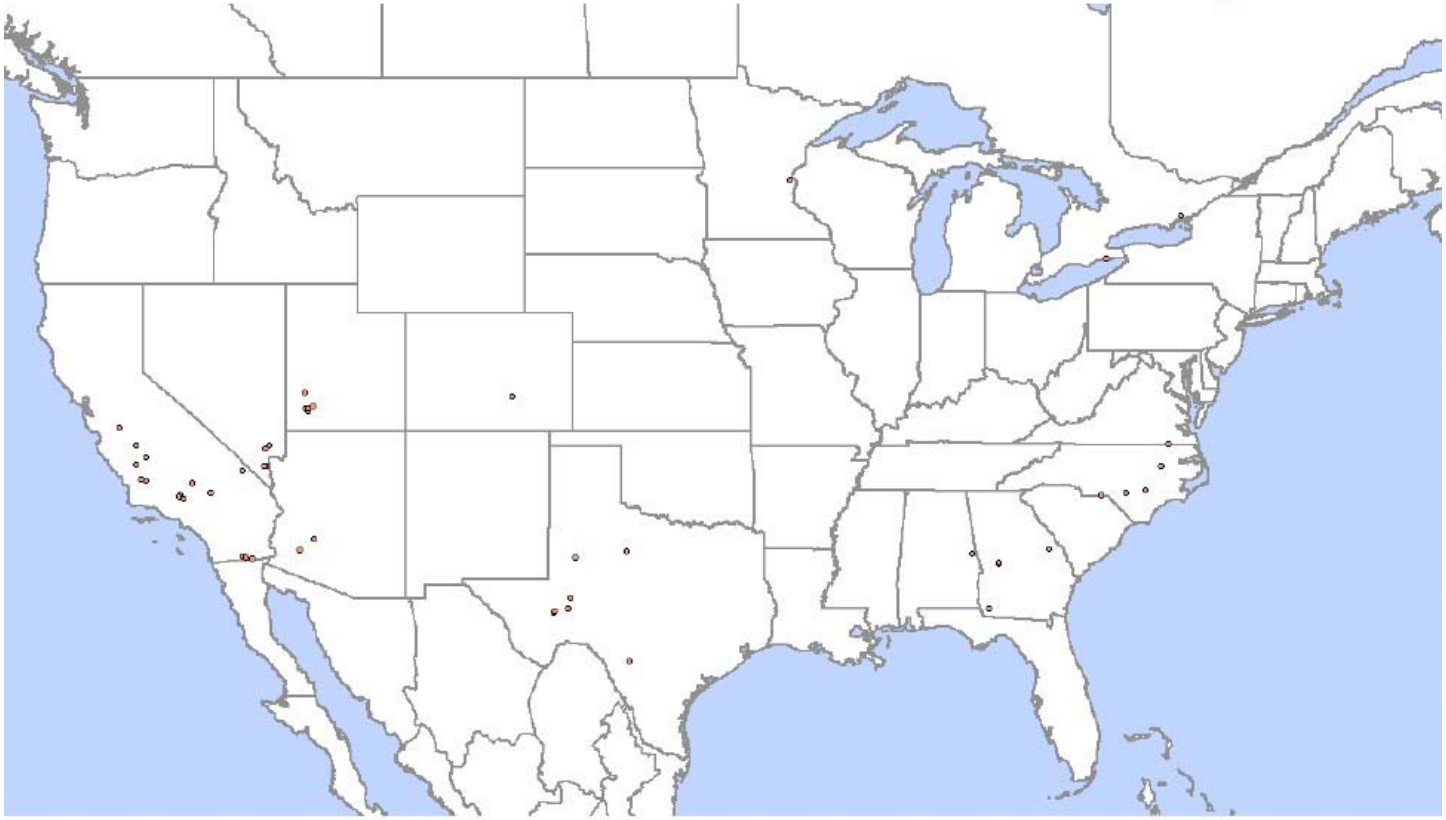
NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

BES Solar Plants



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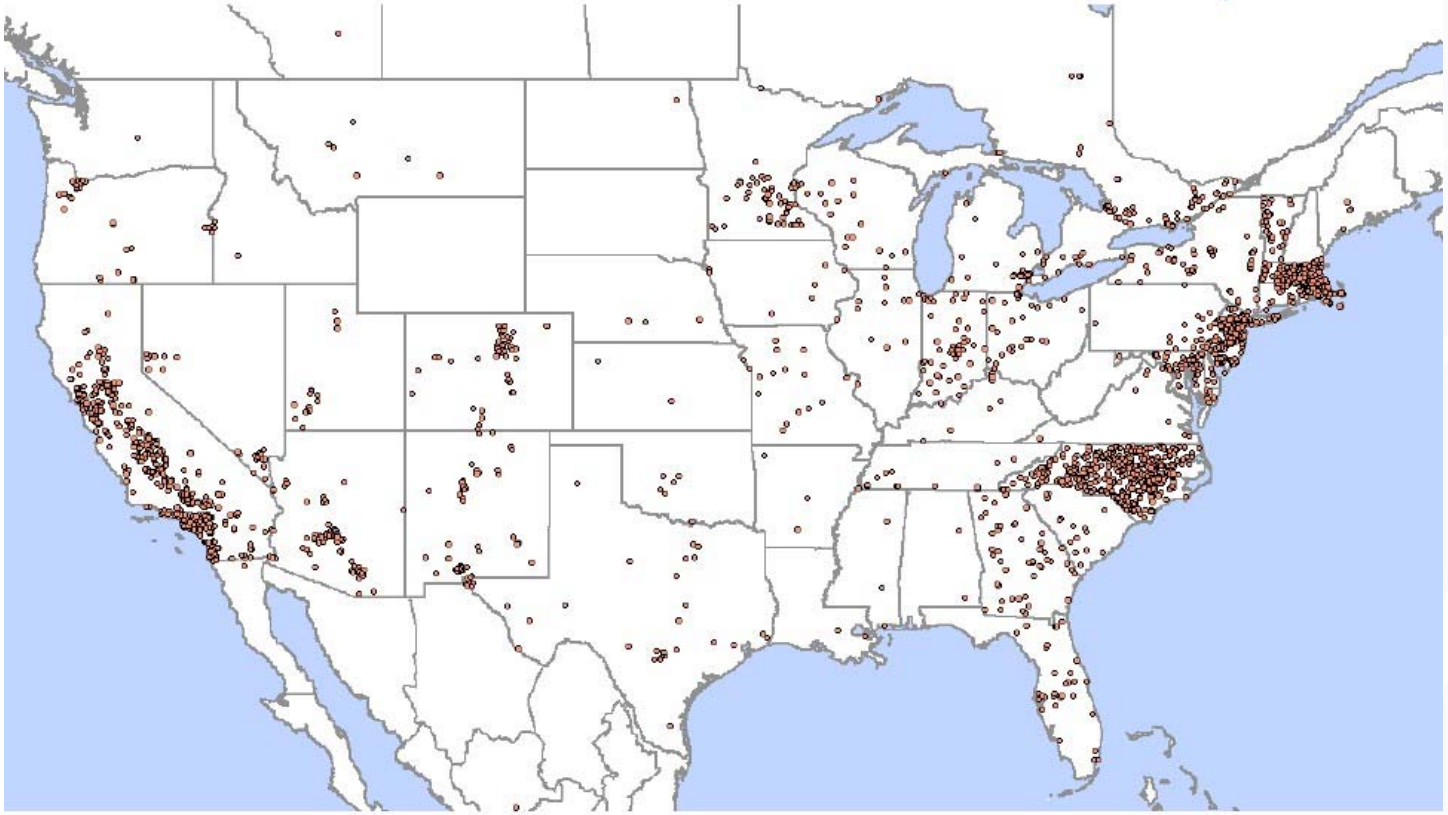
NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Non-BES Solar Plants (Both BPS and Possibly DER)



- Much of installed solar is < 75 MW
- Hence below FERC/NERC jurisdiction
- What grid support requirements are needed from these Distributed Energy Resources (DER)?
- And cyber?

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But Solar is 3% of today's Electricity Generation?…

- **Should Solar care about cyber *now*?**
- **Should State Utility Commissions care about cyber *now*?**

- An Example - an order of magnitude comparison…
- Western Interconnection Grid (i.e. west of the Rockies)
- Loss of Palo Verde 2,000 MW – largest contingency event
- Rooftop/small solar in the West: ~20,000 MW
  - This represents about 95% of all solar in the West; none of which is required to follow NERC CIP….
  - And there is no widely recognized alternative cyber compliance standard for rooftop solar / DER…

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What is linking solar & cyber? *Interconnection*

USAID FROM THE AMERICAN PEOPLE

National Association of Regulatory Utility Commissioners

Why have Interconnection Rules?

Balancing two objectives:

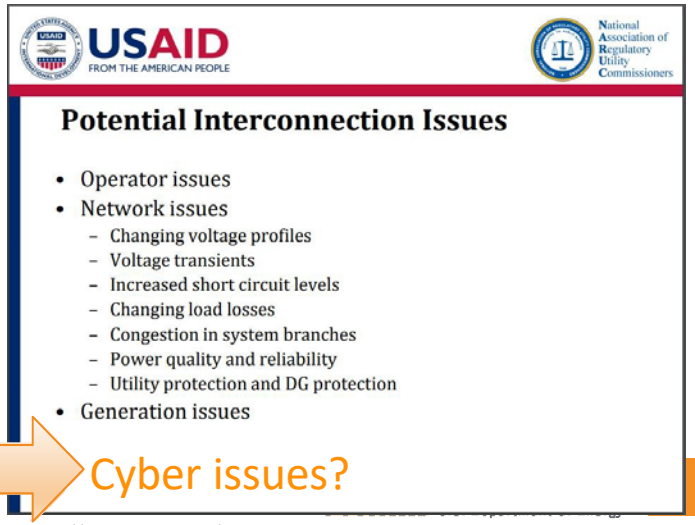
1. Provide a transparent and efficient means to interconnect generation resources to the electric power system.
2. Maintain the safety, reliability and power quality of the electric power system.

https://pubs.naruc.org/pub.cfm?id=5375FAA8-2354-D714-51DB-01C5769A4007

- Interconnection Standards
- Maintain safety, reliability, power quality, and *security*
- IEEE 1547 was just revised for grid support capabilities from DER: e.g. voltage ride through
- But there are no "shall have" cybersecurity requirements
- IEEE 1547.3 is a draft guideline with "may have" cyber requirements

Utility Commission Role?

- In general, utility commissions work to assure that utilities provide reasonable, adequate and efficient service at just and reasonable prices
- Utility regulation takes many forms, including price regulation, resource planning and acquisition, reliability and quality of service regulation
- Rooftop solar / DER are starting to provide grid services
- What cyber issues would you consider during interconnection?



Cyber issues?

https://pubs.naruc.org/pub.cfm?id=5375FAA8-2354-D714-51DB-01C5769A4007

Daniel R. Coats, Former Director of National Intelligence
Testimony to Senate Select Committee on Intelligence, January 29th 2019

- Improved security for our grid is a priority today
- Solar & DER will need to be secured

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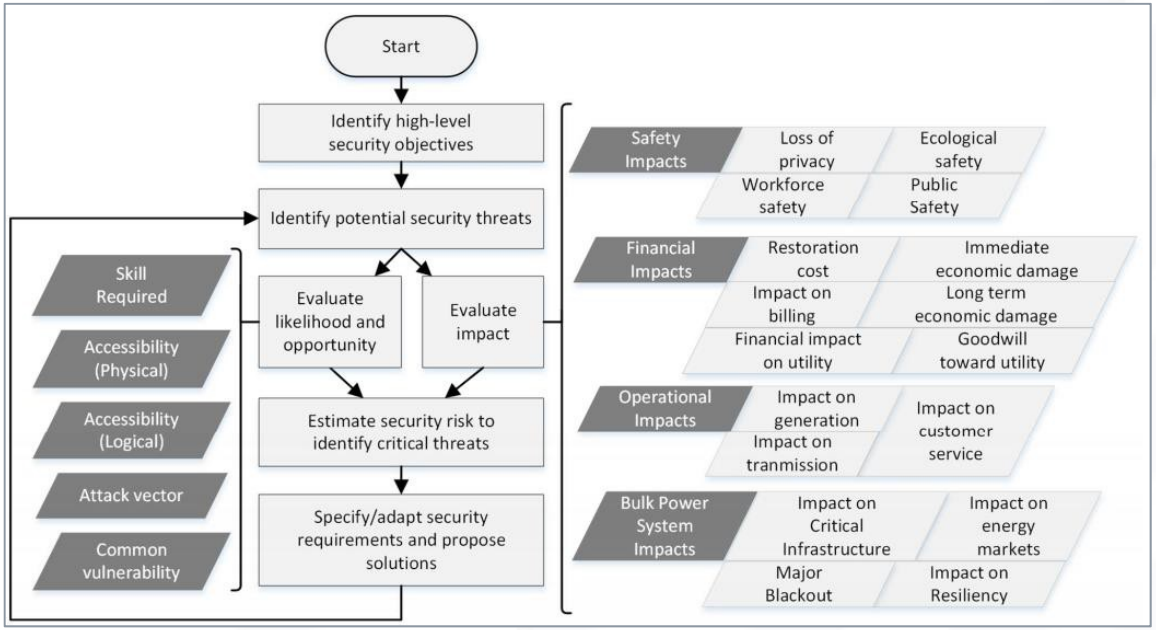
Understanding Systems Roles is Critical

- **Utility Systems** need operational data from devices they do not own and operate
- **DER Aggregators** are becoming 3rd party grid services providers, sending control requests to DER
- **Customers** are not skilled at securing their DER devices

Risk Assessment Frameworks

Maybe Apply NERC CIP to Aggregated Grid-Edge Resources



https://doi.org/10.1016/j.tej.2019.01.018

Or NIST's Cybersecurity Framework (CSF)

https://www.nist.gov/programs-projects/cybersecurity-framework

https://www.nist.gov/document/2018-04-16frameworkv11core1xlsx

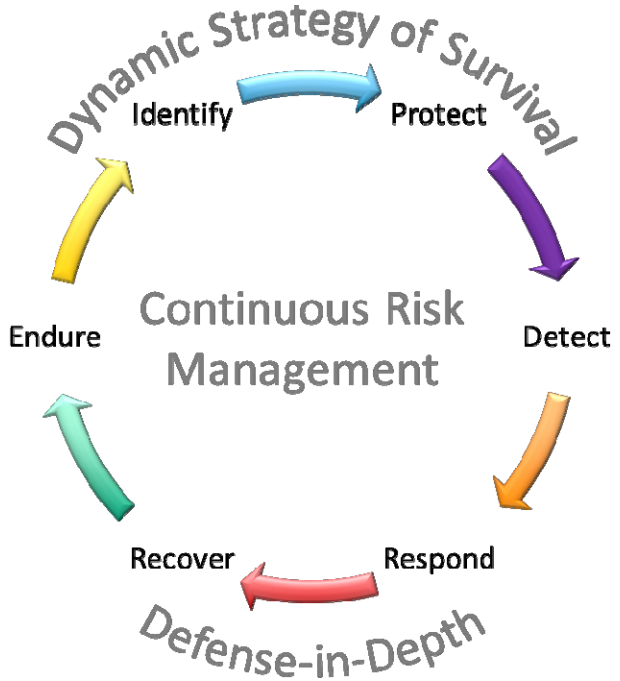
* Note: "Endure" is additive to reflect resiliency needs. Adapted from Jovana Helms at LLNL

Apply Best Practices Today

- **Implement best practices**, as per NIST CSF and/or NERC CIP.
  - No standard for DER to follow now, but they can implement today and support Sandia/SunSpec, IEEE, etc. standards development process.
- **Apply measured, deliberative security based on risk**
  - Should the 40 MW community solar array have the same requirements as residential rooftop solar?
- **Implement with good governance –** executive direction is crucial, and cybersecurity applies to the whole organization. How mature is your organization? Cybersecurity Capability Maturity Model (C2M2)
  - ES-C2M2: https://www.energy.gov/ceser/energy-security/cybersecurity-capability-maturity-model-c2m2-program
- **Move from a compliance perspective to resilience** – incentivize enhanced defense, participate in R&D and work with the DOE.

Apply a Framework for Cybersecurity

- **Goal:** Dynamic, Strategy of Survival
- **Apply:** Defense-in-Depth and Continuous Risk Management
- **Organize:** systematic cyber defense efforts: NIST Cyber Security Framework (CSF); Improve maturity (ES-C2M2)
- Still many challenges:
  - **Clarify roles & responsibility** of Federal, States, Utilities, and DER Vendors
  - **Support threat sharing** between stakeholders
  - **Standards vs R&D** and attacker sophistication
  - **Workforce** training & sufficiency
  - **Fairness & equity:** do not want to erect barriers



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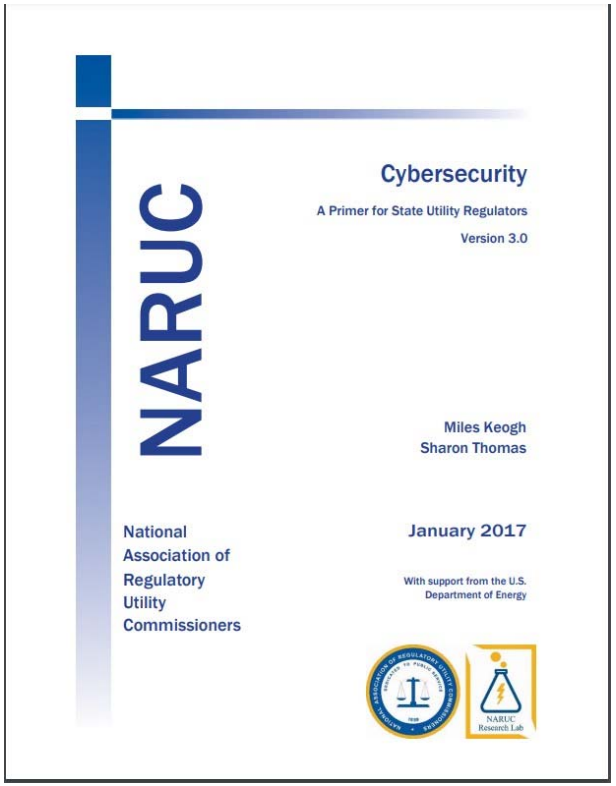
Resources



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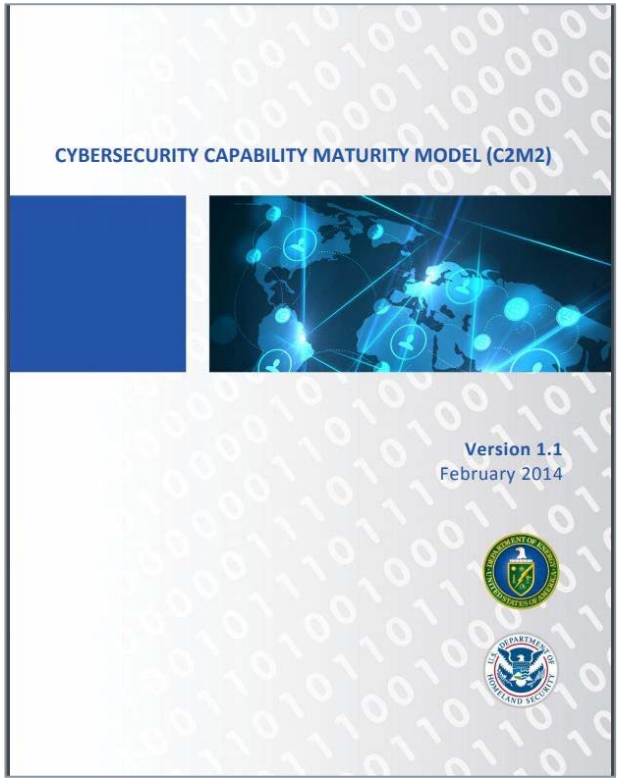
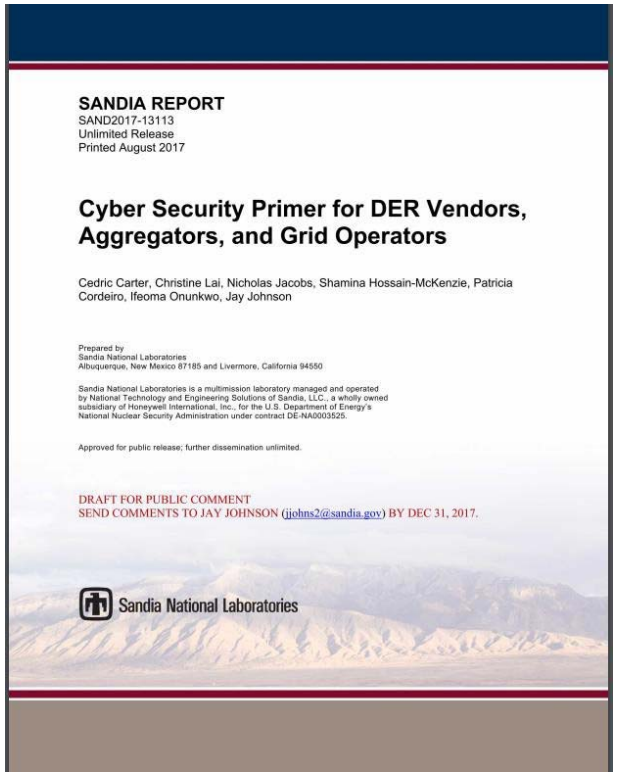


https://www.energy.gov/ceser/energy-security/cybersecurity-capability-maturity-model-c2m2-program



https://www.osti.gov/servlets/purl/1761987

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Questions?

Thank You!

& Let's Work together!

Jeremiah.miller@ee.doe.gov

Example project: NASEO & NARUC CATSS

- NARUC History and Background
- NARUC Staff
- Regulatory Commissions
- NARUC Services to Members
- Past NARUC Presidents
- Update your NARUC member profile
- Employment Opportunities
- Board of Directors
- Executive Committee

NASEO and NARUC Announce Initiative on Cybersecurity in Solar Projects: Cybersecurity Advisory Team for State Solar (CATSS)

View as PDF

For Immediate Release:
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NASEO and NARUC Announce Initiative on Cybersecurity in Solar Projects: Cybersecurity Advisory Team for State Solar (CATSS)

WASHINGTON **(June 18, 2020)** — The National Association of State Energy Officials and the National Association of Regulatory Utility Commissioners have launched a new partnership to mitigate cybersecurity risks and consequences in solar energy developments. With support from the United States Department of Energy Solar Energy Technologies Office, the project will leverage state, federal and private-sector expertise on cybersecurity, grid and photovoltaic to identify model solar-cybersecurity programs and actions for states to take in partnership with utilities and the solar industry.

Cybersecurity Advisory Team for State Solar (CATSS)

April 15, 2021

About NASEO

- Only national non-profit organization whose membership includes the 56 governor-designated energy officials from each state and territory
- Six regions across the nation to aid in sharing lessons learned for successful policy and program replication
- Committee structure includes, Electricity, Energy Security, Buildings, Financing, Transportation, Government Affairs
- Acts as a repository of information on issues of particular concern to the states and their citizens (e.g., grid modernization, energy resilience, energy security, cybersecurity, energy equity, energy-air integration)
- Improves the effectiveness of state energy programs and policies
- Serves as the voice of State Energy Offices in Washington, D.C.

NASEO Project Areas

Buildings
- Building Energy Codes
- Grid-Interactive Efficient Buildings WG
- Home Energy Labeling

Electricity
- Microgrids State WG
- Comprehensive Electricity Planning Task Force
- Resilience

Energy Financing
- Energy Savings Performance Contracting
- Property Assessed Clean Energy
- On-bill Financing

Equity
- Considerations of Equity into State Energy Policy
- Data Implications

Energy Security
- Energy Assurance Planning
- Active Responses
- Cybersecurity
- Hazard Mitigation

Solar
- Solar Soft Costs
- Solar Cyber
- Low-Income Solar

State Energy Planning
- State Energy Planning Guidelines
- Best Practices

Technology Innovation
- Technology Innovation Processes
- Federal Activities

Transportation
- Volkswagen Settlement
- REV West
- Electric Vehicles & Alternative Fuels

Crosscutting Issues: Resilience, Energy Jobs, COVID-19, Economic Recovery, etc.

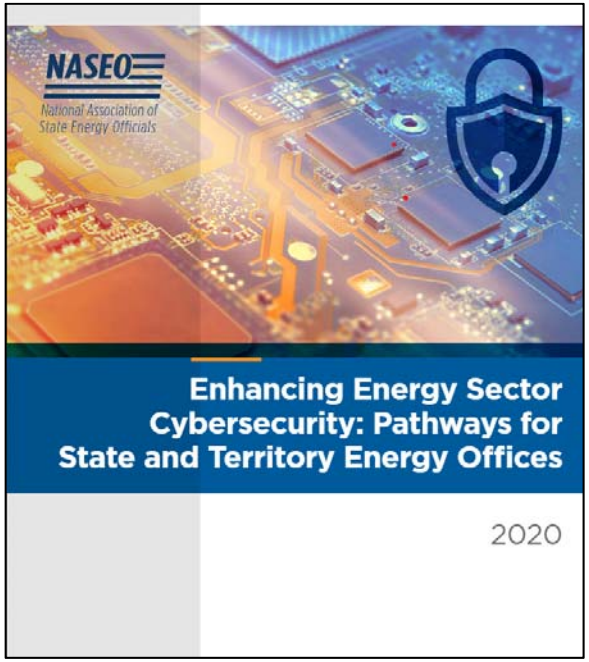
About NARUC

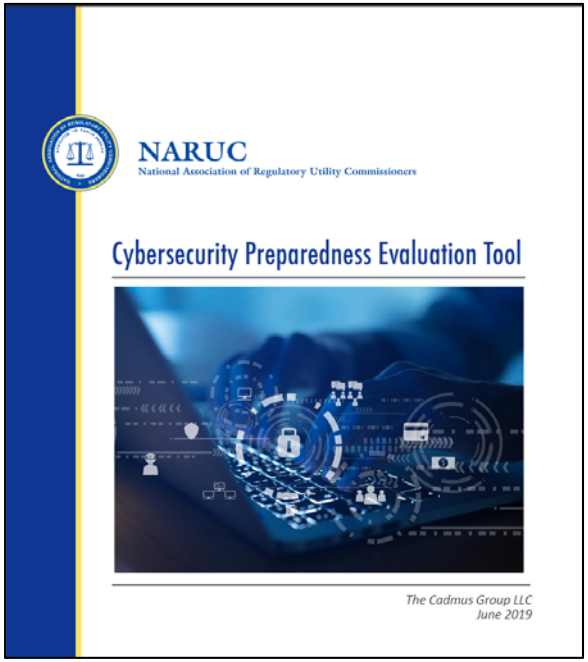
- Non-profit organization dedicated to representing the state public service commissions
- Public service commissions regulate the utilities that provide essential services such as energy, telecommunications, power, water, and transportation
- NARUC's members include all 50 states, the District of Columbia, Puerto Rico, and the Virgin Islands
- Most state commissioners are appointed to their positions by their governor or legislature, while commissioners in 14 states are elected
- NARUC's members have an obligation to ensure the establishment and maintenance of utility services as may be required by law and to ensure that such services are provided at rates and conditions that are fair, reasonable, and nondiscriminatory for all consumers

NARUC Center for Partnerships & Innovation

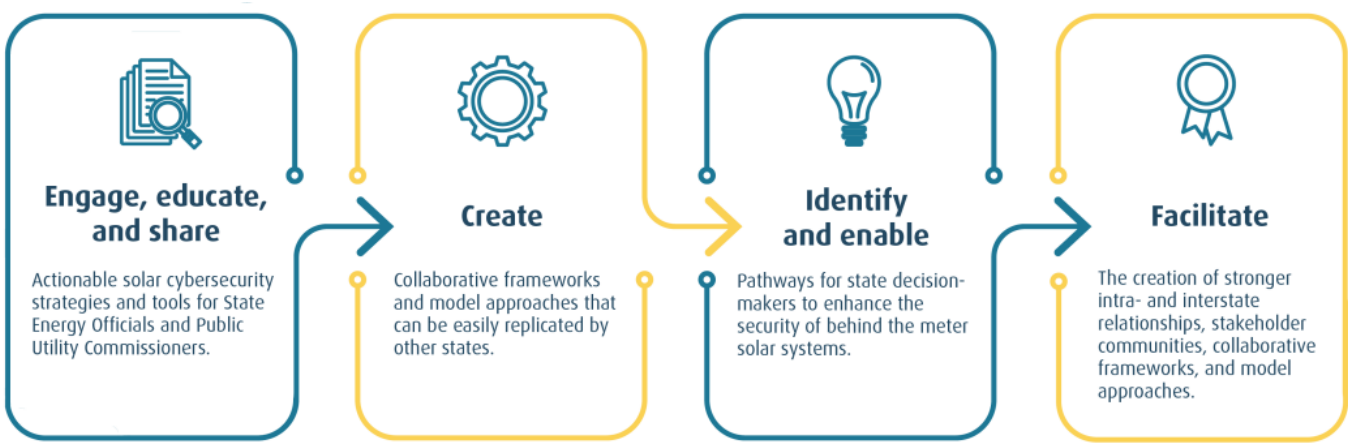
- Identifies emerging challenges and connects state commissions with expertise and strategies to navigate complex decision-making.
- Build relationships, develop resources, and deliver training that provides answers to state commissions' questions.
- Resources include webinars, peer sharing calls, papers, site visits, trainings, workshops and more.
- NARUC CPI conducts work in four major topical areas:
  - Energy Infrastructure Modernization (i.e., Smart Grid, Electric Vehicles, etc.)
  - Electricity System Transition (i.e., Distribution System Planning, Valuation and Ratemaking, etc.)
  - Critical Infrastructure, Cybersecurity, and Resilience
  - Emerging Issues (i.e., innovation webinars)

Previous Relevant NASEO and NARUC Cybersecurity Work

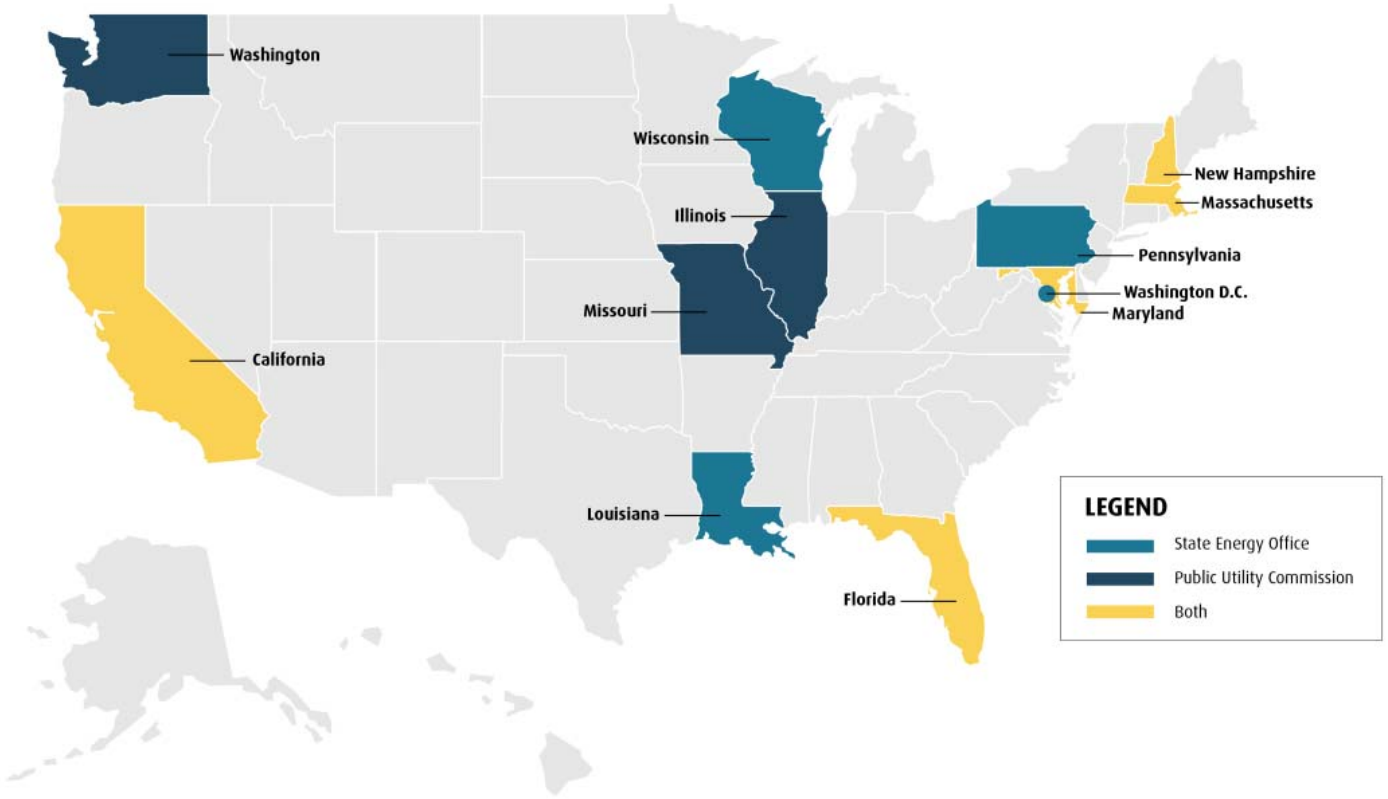




CATSS High-Level Objectives



CATSS State Participants



Key Partners

- American Public Power Association
- Archer International
- Edison Electric Institute
- Electric Power Research Institute
- Idaho National Lab
- National Electrical Manufacturers Association
- National Institute of Standards and Technology
- National Renewable Energy Lab
- National Rural Electric Cooperative Association
- PJM
- Sandia National Lab
- Schneider Electric
- Solar Energy Industries Association
- Sunrun
- SunSpec
- Tesla
- UL
- U.S. Department of Energy
  - CESER
  - OE
  - SETO

State Needs Assessments

Solar Cybersecurity Education for State Energy Offices and Public Service Commissions

Cost Recovery and Valuation Needs

Policy and Regulation Guidance

State Needs Assessments- Education

Resources on DER and cybersecurity measures	Overview of the current state of DER security and landscape of research	Impact and consequence assessments
Roles of State Energy Offices and Public Utilities Commissions	Federal and State Policy and Regulations	Standards Setting and Role

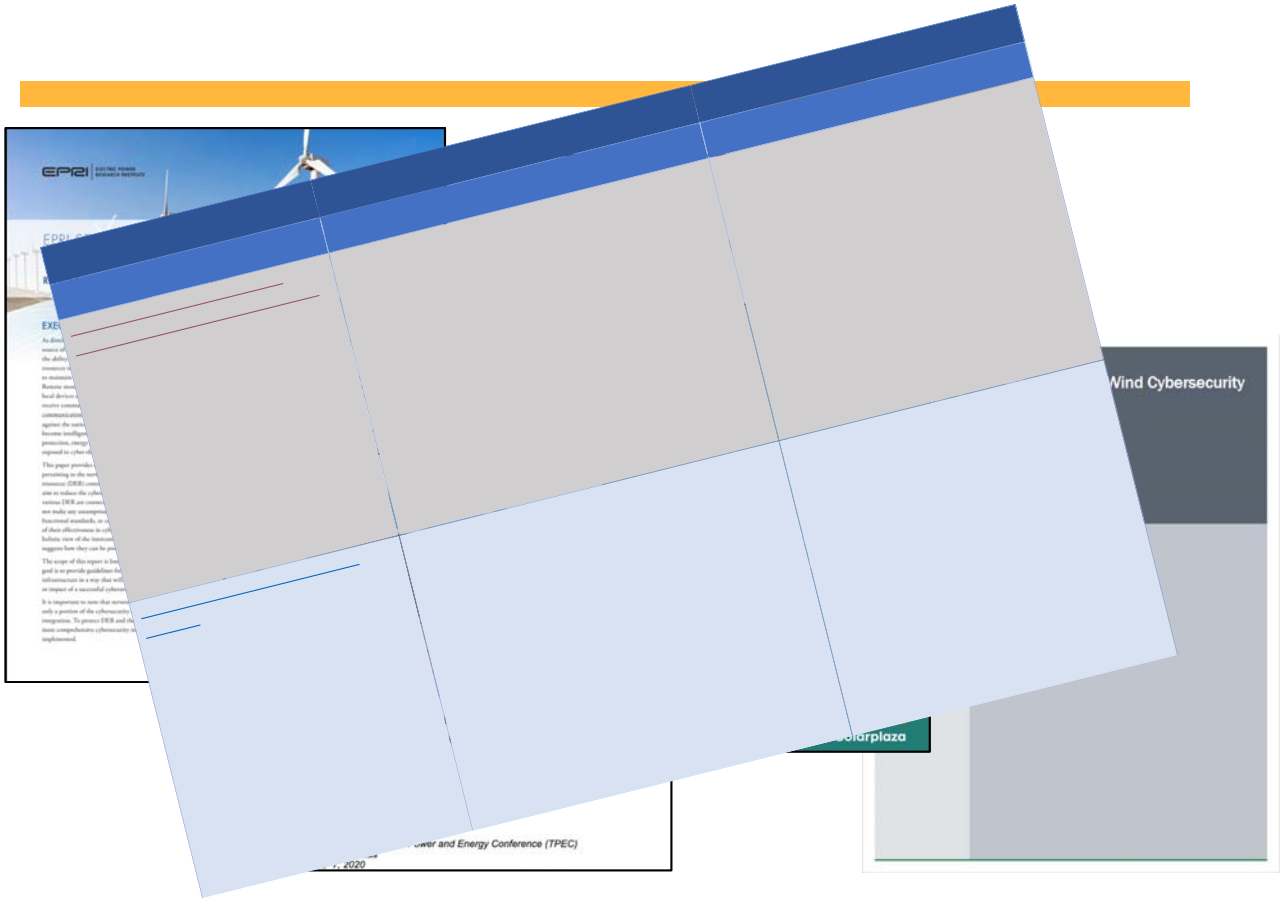
State Needs Assessments- Cost Recovery and Valuation Needs

- Help to determine appropriate cost-recovery mechanisms
- Cybersecurity role in utility ratemaking
- Impact of standards on cost-recovery
- Understanding of rate recovery mechanisms and alternatives to rate cases

State Needs Assessments – Policy and Regulatory Guidance

- Guidance on how to engage utilities on solar cybersecurity
- Engagement of states on standards and incentives
- Identification of appropriate solutions to having open conversations about cybersecurity
- Guidance on state and federal responsibilities
- Models and state examples of toles and responsibilities
- Workforce considerations

Literature Review



Project Roadmap – Potential Tools and Resources for State Use

- Educate State Energy Offices and Public Utility Commissions
- Create Tools for State Organizations to Convene and Strategize
- Provide Solution Examples to States

Phase 1: Educate State Energy Offices and Public Utility Commissions

- Resource Library
- Glossary of Key Terms
- Engineering and Systems Overview
- Risk Ownership Framework

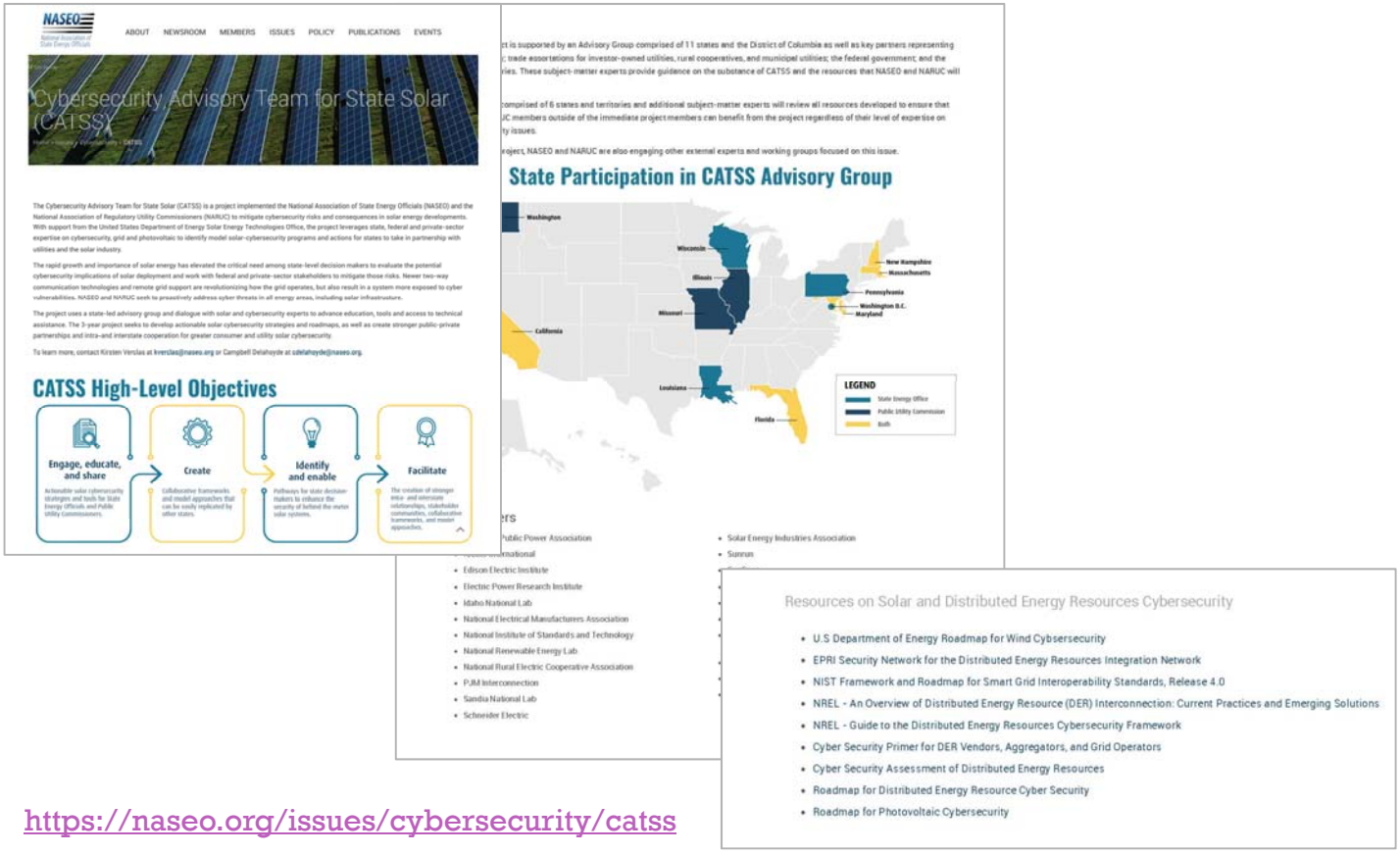
Phase 2: Create Tools for State Organizations to Convene and Strategize

- Consequence Forecasting Guidance
- Objective Mapping Guidance
- Organizational Role Chart Template
- Stakeholder Engagement Strategy

Phase 3: Provide Solution Examples to States

- A. Policy Tools Examples
- B. Decision Support and Assessment Tools
- C. Programmatic and Project Supplements/Templates

Resources – CATSS Webpage



https://naseo.org/issues/cybersecurity/catss

Thank you!

- NASEO
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- NARUC
  - Lynn Costantini (lcostantini@naruc.org)
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National Association of State Energy Officials

Q&A

SUBMIT USING THE QUESTIONS PANE IN THE CONTROL PANEL

NARUC Innovation Webinar series

Hosted one Thursday each month from 3:00 p.m. to 4:00 p.m. ET

- **Staffing the Evolving PUC Workforce: Exploring Recruitment, Retention, and Alternative Tactics**

  May 13, 2021 | 3:00 – 4:00 pm Eastern

- **Balancing the Clean Grid: Inertia, Reliability, and Renewable Energy**

  June 17, 2021 | 3:00 - 4:00 PM Eastern

*Register at: **https://www.naruc.org/cpi-1/emerging-issues/innovation-webinars/***

NARUC thanks the U.S. Department of Energy for support for this series.

THANK YOU

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