

# Information Session: Introduction to the CPUC Equitable Resiliency Study

Grid Resiliency and Microgrids Team, Energy Division  
September 10, 2024 10:00 AM–12:00 PM Pacific



California Public  
Utilities Commission

# WebEx and Call-In Information

## Join by Computer:

<https://lumen.webex.com/lumen/j.php?MTID=m7a84f38e59125e610d06aba0a4c1e61c>

Event number: 2535 134 9849

Event password: 1234

## Join by Phone:

1-415-655-0001 (Local/U.S. Toll)

Access Code: 2535 134 9849

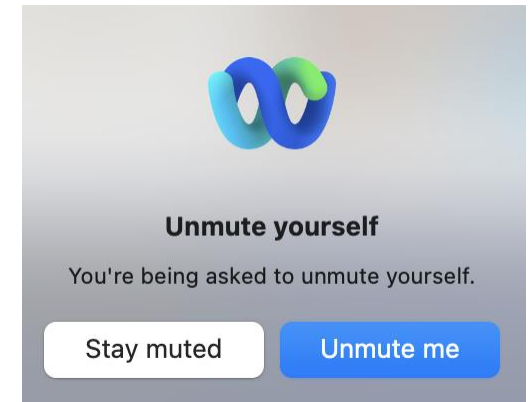
(Staff recommends using your computer's audio if possible.)

## Notes:

- Today's presentations are available in the meeting invite (follow link above) and will be available shortly after the meeting on <https://www.cpuc.ca.gov/resiliencyandmicrogrids>.
- This meeting will be recorded and posted on <https://www.cpuc.ca.gov/resiliencyandmicrogrids>.
- While one or more Commissioners and/or their staff may be present, no decisions will be made at this meeting.

# WebEx Logistics

- All attendees are muted on entry by default.
- Questions can be asked verbally during Q&A segments using the “raise hand” function.
  - The host will request to unmute you during Q&A portions [and you will have a maximum of 2 minutes to ask your question].
  - Please lower your hand after you’ve asked your question by clicking on “raise hand” again.
  - If you have another question, please “re-raise your hand” by clicking on the “raise hand” button twice.
- Questions can also be written in the Q&A box and will be answered verbally during Q&A segments.



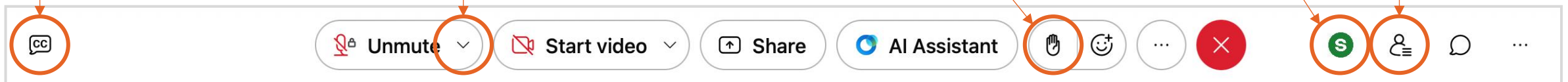
**1. Closed Captioning can be turned on by clicking the “cc” button the lower left of your screen.**

**2. Access your meeting audio settings here**

**3. Raise your hand by clicking the hand icon.**  
**4. Lower it by clicking again.**

**5. Access the written Q&A panel here (Slido)**

**6. Click here to access the attendee list.**



# Agenda

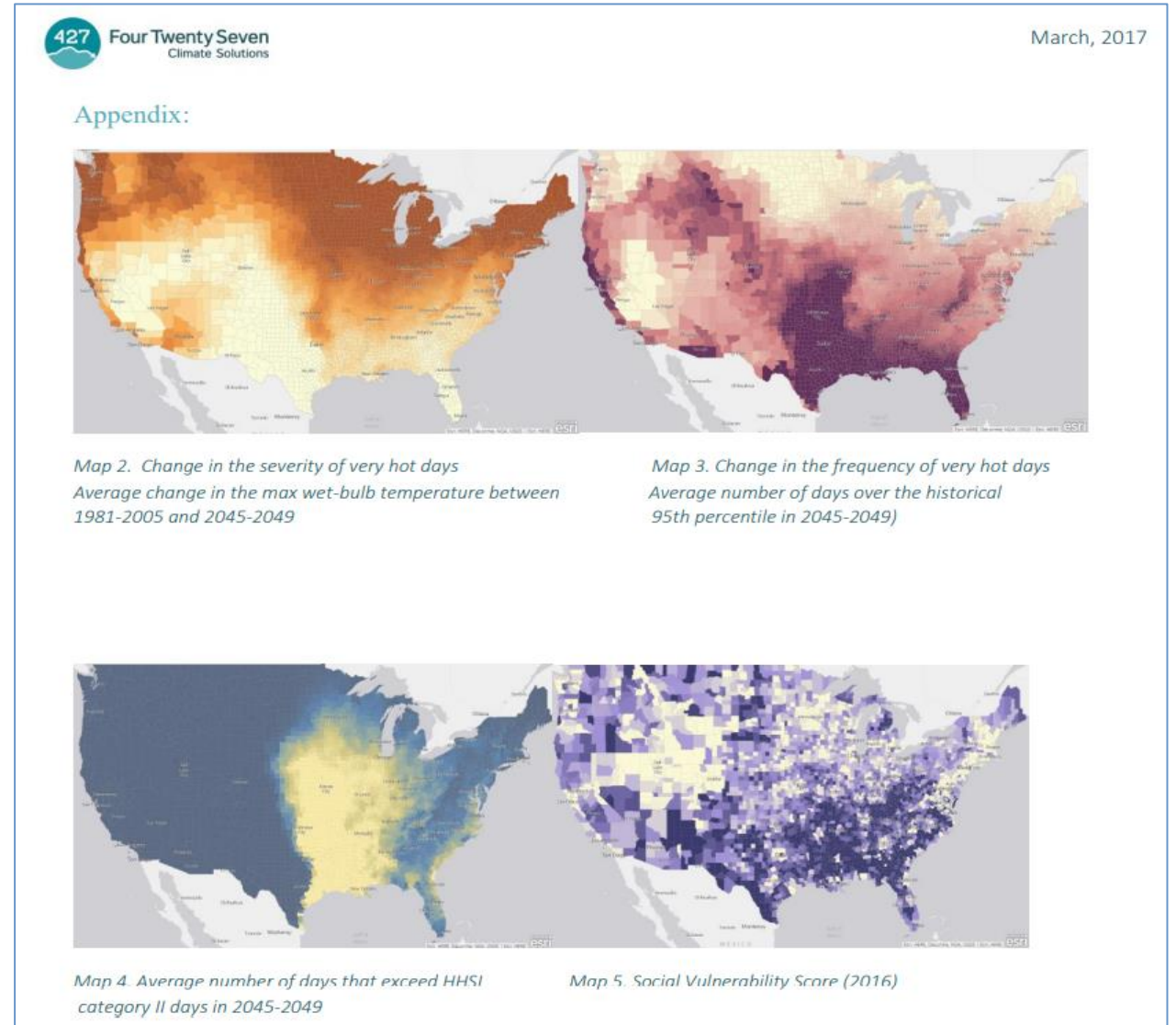
- |   |                                |
|---|--------------------------------|
| <b>I. Introduction</b> <i>(CPUC Staff)</i>  | <b>10:00a–10:05a (Pacific)</b> |
| a. WebEx logistics, agenda review   |                                |
| <b>II. Review of Resiliency Work To-Date</b> <i>(CPUC Staff)</i>  | <b>10:05a–10:15a</b>           |
| a. 4-Pillar Methodology development and demonstrations  |                                |
| b. Need for a comprehensive analytical tool   |                                |
| c. Vision for the CPUC Equitable Resiliency study   |                                |
| <b>III. Equitable Resiliency Index &amp; Demos (incl. Q&amp;A and polls)</b><br><i>(Lumen Energy Strategy, Spatial Informatics Group)</i> | <b>10:15a–11:25a</b>           |
| a. Analytical approach and work plan <i>(Lumen)</i>   | 10:15a–10:45a                  |
| b. Overview of key data sources <i>(Lumen)</i>  | 10:45a–11:05a                  |
| c. Examples of geo-spatial decision support tools and indices <i>(SIG)</i>  | 11:05a–11:25a                  |
| <b>IV. Additional Q&amp;A</b>   | <b>11:25a–11:50a</b>           |
| <b>V. Next Steps, Upcoming Information Sessions</b> <i>(CPUC Staff)</i>   | <b>11:50a–12:00p</b>           |

# Review of Resiliency Work To-Date

(CPUC Staff)

# The Problem to Solve: How can we optimize grid investments to integrate resiliency?

- CLIMATE CHANGE DISRUPTIONS: We are expecting **more extreme disruptions** and a **wider range of types of disruptions**. Climate change is turning Low Frequency/High Impact events into **High Frequency/High Impact events**.
- EQUITY DISPARITY: Equity disparity is revealing itself with each event; **resiliency valuation is different for those at opposite ends of the equity and wealth spectrum**.
- INTERDEPENDENCIES: Disruptions highlight **interdependencies between critical infrastructure systems**.
- DECARBONIZATION/ELECTRIFICATION: To minimize climate change, it is **critical to shift to decarbonized electrification**. As this increases dependency on electrical system, it is also critical that measures are taken to **increase confidence in electrification**.



# System Function Relationships to Measure Improved Resiliency

## ENERGY System Function:

- operating levels – MW, MW/hrs, MW \* hours
- infrastructure levels -- # lines/circuits functional, # lines/circuits tripped, # lines/circuits restored

## INTERDEPENDENT System Functions:

- Water/Wastewater
- Gas
- Communications
- Transportation

## ECONOMIC System Function:

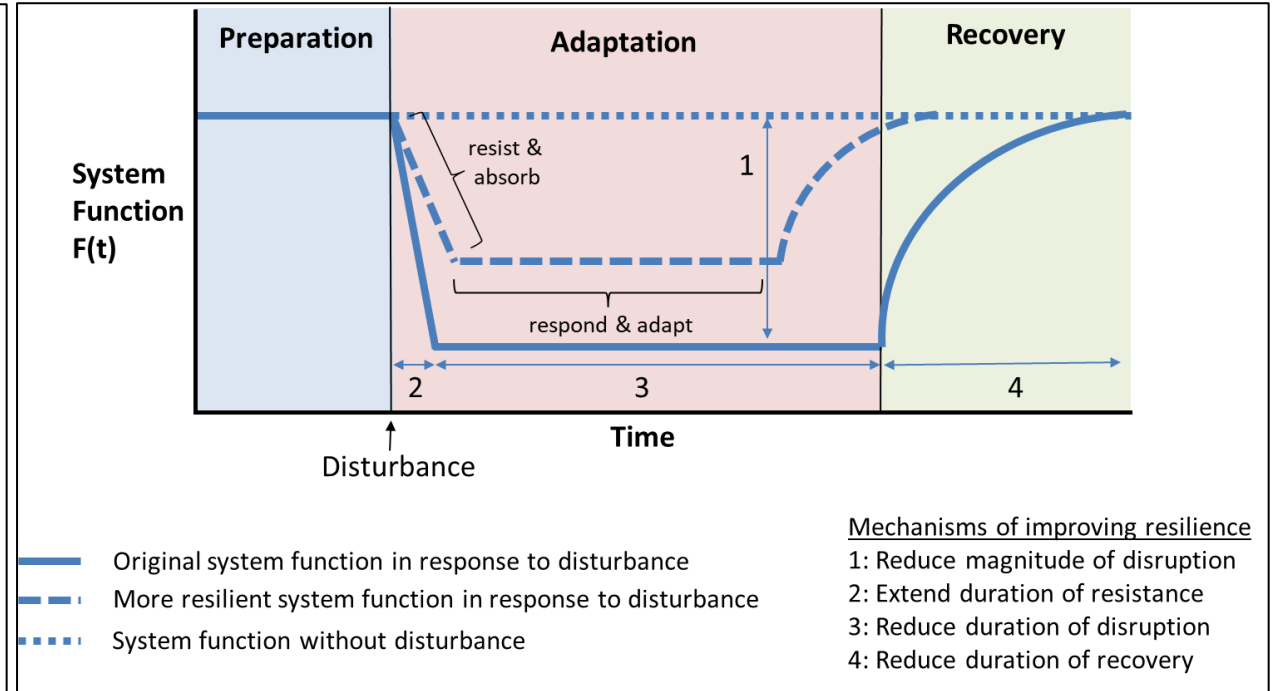
- Revenue and productivity due to power disruption
- Income and perishable losses due to power disruption

## SOCIAL/EQUITY System Function:

- # of vulnerable or disadvantaged population in area served
- # of Critical Facilities
- Change in Social Burden Index (ReNCAT)

## ENVIRONMENTAL System function:

- GHG, Criteria Air Pollutant Emissions



Resilience Trapezoid (adapted from Panteli, et al. (2017); T. Ding, Y. Lin, G. Li, et al. (2017); T. Ding, Y. Lin, Z. Bie, et al. (2017))

# 4-Pillar Methodology of Equitable Resiliency Evaluation and Planning

## I. Baseline Assessment

- 1) Define geographical area of study
- 2) Define load tiers or resilience categories (Critical, Priority, Discretionary)
- 3) Identify minimum resiliency targets within load tiers (e.g. 100% Critical, 30% Priority, 0% Discretionary)
- 4) Define hazards to consider (All-Hazard assessment, analysis, ranking, weighting)
- 5) Conduct assessment of current resiliency when disrupted from Hazard 1, Hazard 2, Hazard 3 (according to Hazard assessment)
- 6) Results of resilience assessment – Identify resiliency deficits and priorities and resiliency metric reporting of baseline levels

## II. Mitigation Measure Assessment

- 1) Identify potential mitigation measure options
- 2) Assess ability of each mitigation option to reach resiliency targets for Hazard 1, Hazard 2, Hazard 3
- 3) Compare costs of each mitigation option to reach resiliency targets for Hazard 1, Hazard 2, Hazard 3

## III. Resiliency “Scorecard”

- 1) Resiliency Scorecard is a suggested tool that provides a basic benchmark of achievement but recognizes that more can be done.
- 2) Scoring reflects resiliency configuration characteristics.
- 3) Scoring system provides for different areas of improvement (e.g. 100% resilience targets are met, but configuration uses 70% fossil fuel resources to meet those targets, improvement would be to decrease fossil fuel resources while maintaining targets. Would result in a higher “score.”)

## IV. Resiliency Response Assessment (computer modeling or post-disruption approach)

- 1) Conduct Baseline Assessment (1-6).
- 2) After implementation of chosen mitigation measure option, conduct annual data collection of Resiliency Metrics,
- 3) Assess achievement of resiliency targets and any changes in community impacts



# Energy Division Workshop Series on Resiliency

Dates	Workshop	Presenters	Description
05/10/2022	Interruption Cost Estimate (ICE) Calculator / Power Outage Economic Tool (POET)	Lawrence Berkeley National Labs	Top-down econometric reflection of the value of lost load
07/22/2022, 07/26/2023, 11/28/2023	Resiliency Node Cluster Analysis Tool (ReNCAT) and the Social Burden Index (SBI); Pilot Partnership Project	Sandia National Labs and Southern California Edison (SCE)	Bottom-up reflection of social burden and impacts of large-scale electrical system disruption
08/22/2023	The Value of Sharing and Consolidating Critical Community, Electricity, and Natural Hazard Information	Lawrence Berkeley National Labs	Translating hazard mitigation plans into geospatial layers to enable greater coordination of resilience planning between local authorities and utilities
10/19/2023	Use Case Demonstrations of the 4-Pillar Methodology of Resiliency Planning and Evaluation	San Diego Gas & Electric (SDG&E) and Sonoma County Junior College District	4 Pillar Methodology applied to small scale and medium scale applications of resilience planning
05/10/2023, 09/05/2023 11/08/2023	Resiliency Standards: Definitions, Metrics and Methodologies	Lumen Energy Strategy	Discussion of resiliency definitions and metrics as standards for applications using grid planning scale use case

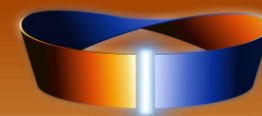
# Introduction to the CPUC Equitable Resiliency Study

EQUITABLE RESILIENCY INDEX & DEMOS

A collaboration with Lumen Energy Strategy, LLC  
and Spatial Informatics Group, LLC



In affiliation with the EPIC-funded  
*WARP to Resilience* initiative



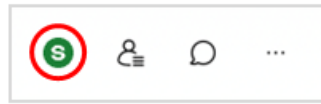
**WARP** to Resilience  
*Weather-Adapted Resource Planning*

# Discussion and Q&A

## WebEx Tip

Option 1:

Access the written Q&A panel here



Option 2:

1. Click here to access the attendee list and see who has raised their hand.



2. Raise your hand by clicking the hand icon.



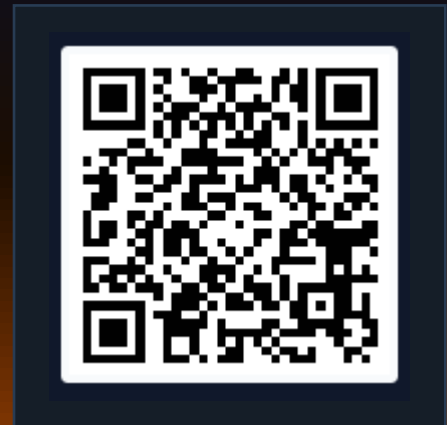
3. Lower it by clicking again.

# Audience Polls

**OPTION 1: web browser**  
*(recommended)*

[PolleEV.com/lumen999](https://PolleEV.com/lumen999)

Page will update as new polls are activated

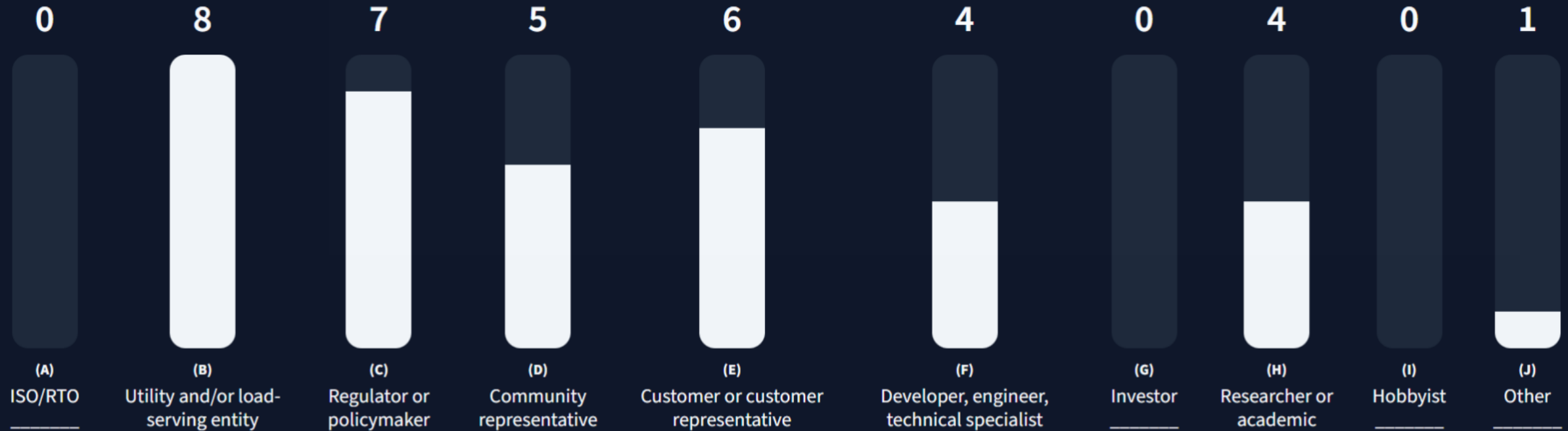


**OPTION 2: phone**

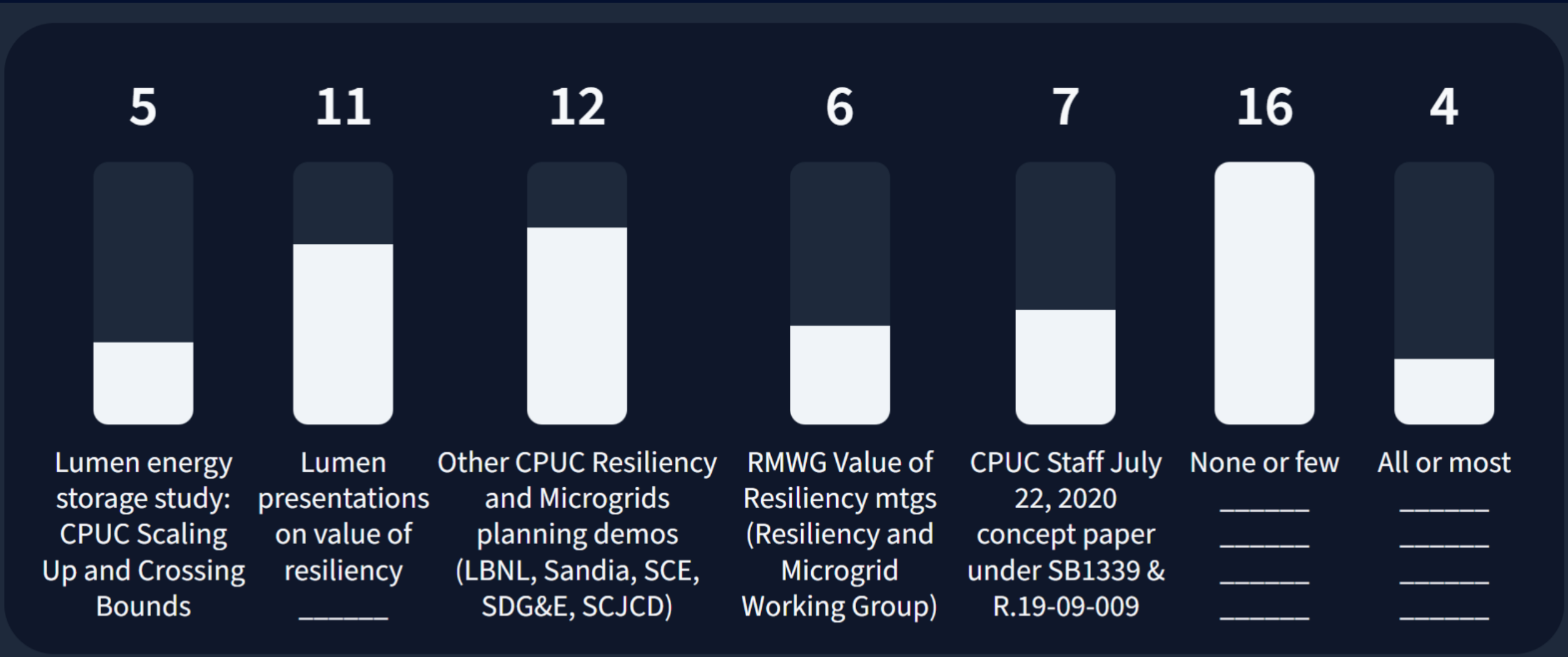
**Text "lumen999" to 22333**  
Follow prompts

# What stakeholder perspective best describes you?

Join by Web [PollEv.com/lumen999](https://PollEv.com/lumen999) Join by Text Send **lumen999** to **22333**



Which related **events and materials** have you attended or reviewed? (select all that apply)



# ANALYTICAL APPROACH AND WORK PLAN

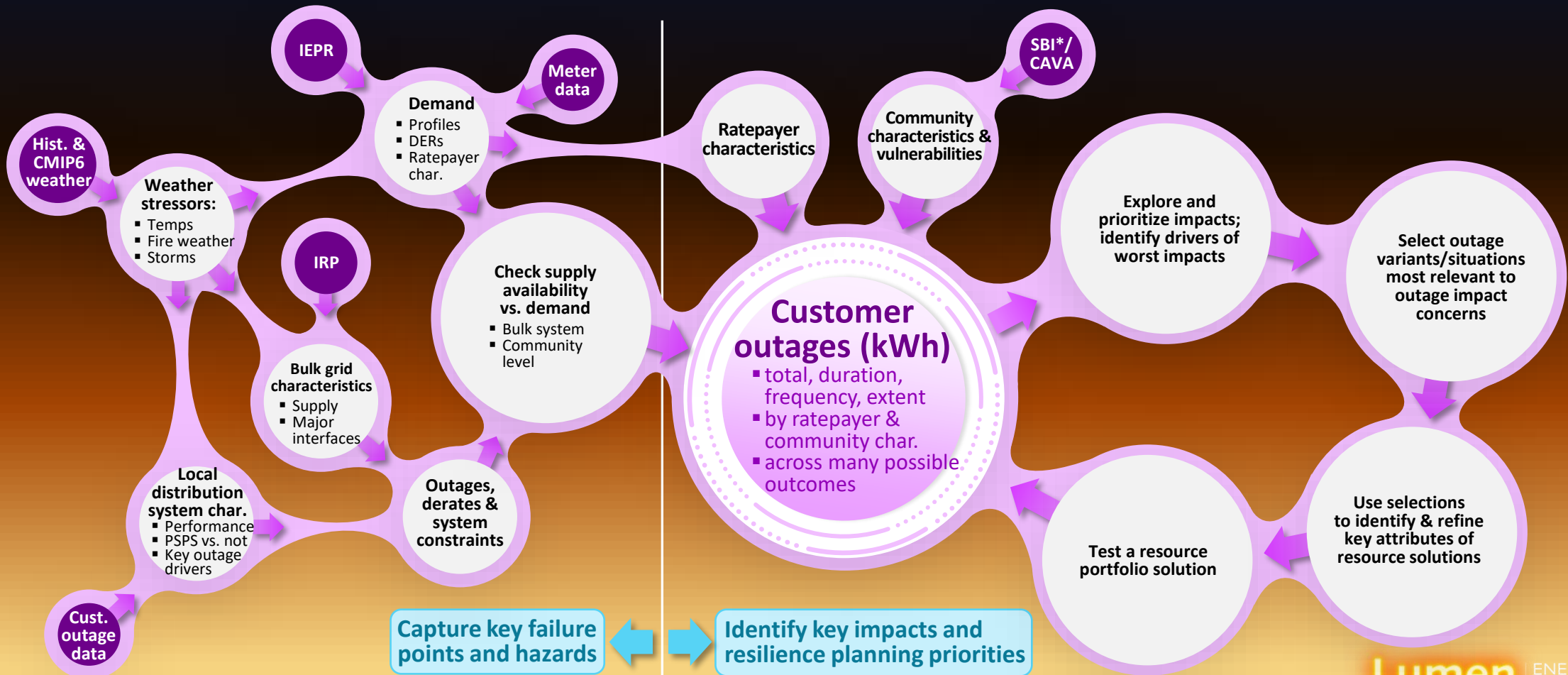
# Study objective

Develop and demonstrate a geo-spatial equitable resiliency index model that leverages existing data-driven tools and bridges gaps in current regulatory policies and practices to facilitate **resilient, equitable, cost-effective, and affordable** electricity grid infrastructure investments



# WARP to Resilience model

Key model elements discussed in our Nov'23 workshop—centered around outage impacts to electric customers



Capture key failure points and hazards

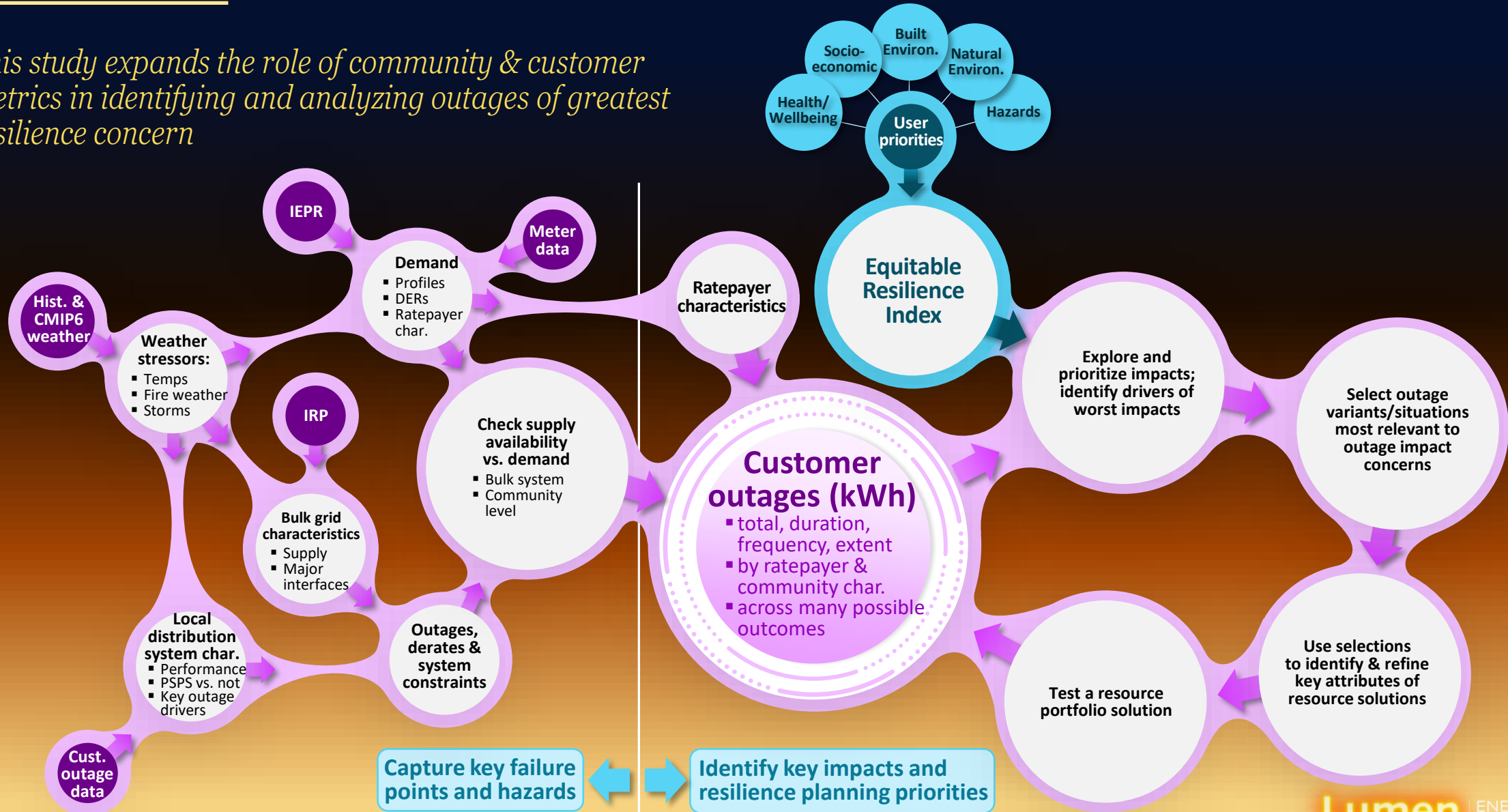
Identify key impacts and resilience planning priorities

\*Social Burden Index



# Opportunity for data-driven representation of resilience

*This study expands the role of community & customer metrics in identifying and analyzing outages of greatest resilience concern*



# Resilience evaluation model architecture

- **The *WARP to Resilience* model is designed as:**

- Stochastic, hourly, model for a given planning year
- Key output is loss-of-load (LOL) metrics; measured at the bulk grid level and distribution system level
- Resource portfolio is an input
- When complete, demo assumptions, model, and results open for public review and use

- **The equitable resilience index helps the user to:**

- Better understand community and customer vulnerabilities that reduce their ability to withstand, reduce the impacts of, and recover from electricity outages
- Compare against and weight modeled outage outcomes, to focus on those of most concern in resilience planning
- Through outage weightings, quantify and compare the ability of alternative resource solutions to improve resilience under the modeled outage outcomes of most concern
- With user inputs on resource costs, calculate a risk-spend efficiency metric (% reduction in outages of concern for every \$ spent) to better understand tradeoffs of alternative resource plans



# Data and models as decision support tools

*Tough decisions are best made by people, using the best information and analytics available, but also using creative and visionary thinking, and through clear definition of risks and risk tolerances.*

\*\*\*\*\*

*“In our age... we have been so persuaded that everything is data, everything [can be] measured, and therefore it can be analyzed, and therefore you can know—it has resulted in two things: first of all, a lot of collection of a lot of data that doesn’t mean a damn thing, but secondly, more damagingly, I think, an inability to make a decision where you can’t predict a successful outcome without the perfect data model to back it up. Our obsession with data has persuaded people that now they can have certainty beforehand.”*

Margaret Heffernan

Executive coach and author of *Uncharted: How to Map the Future*

Interview excerpt from *Wisdom from the Top* with Guy Raz

# Model general applications

*Goal: Scalable model applications to support grid planning, project comparisons, and problem-specific mitigation plans*

- **Grid planning application** to synergize systemwide resource portfolio selection with local resilience needs
- **Project-specific application** to inform project selection, sizing, and configuration decisions to address outage concerns at a specific location
- **Problem-specific application** to evaluate outage implications of a particular problem and identify resource attributes and locations for mitigation

# Demonstrated use cases

## Grid planning

## Project-specific

## Problem-specific

*Example use case/demo #1:*

*Example use case/demo #2:*

*Example use case/demo #3:*

	<i>Example use case/demo #1:</i>	<i>Example use case/demo #2:</i>	<i>Example use case/demo #3:</i>
<b>User</b>	Load-serving entity (LSE)	Customer	Local Authority
<b>Perspective</b>	Ratepayer	Private	Societal (within a community)
<b>Analytical scope</b>	What mix of resource solutions best synergizes with community and customer-level investments?	Flipside to grid planning demo, how can a project operate to cover all/most resilience risk (depending on risk tolerances) while also offering system services to ratepayers?	Where are investment dollars best spent to mitigate outages and the impacts of outages?
<b>Use model to</b>	<ul style="list-style-type: none"> <li>▪ Better understand scope of resilience problem, then technical potential for portfolio of DER resilience solutions (MW/MWh)</li> <li>▪ DER time profile of potential availability to the grid for system services, and likely geographic distribution</li> </ul>	<ul style="list-style-type: none"> <li>▪ Better understand outage risk profile, including historical/current risks and potential future risks</li> <li>▪ Select preferences for resource ops to mitigate that risk; analyze tradeoff with market revenues</li> </ul>	<ul style="list-style-type: none"> <li>▪ Better understand scope of community hazards and vulnerabilities that might lead to, or be compounded with, electricity outages</li> <li>▪ Select preferences for key hazards and vulnerabilities of concern</li> <li>▪ Analyze tradeoffs of placing resources in one area (e.g., Census Tract) versus another</li> </ul>
<b>Model outputs enable user to</b>	Refine their modeling of DERs accordingly and re-optimize resource plans	Refine planned project size/configuration/operating strategy accordingly and re-estimate net cost given expected market revenues	Refine planned project placement and characteristics accordingly

# Schedule and key deliverables

- **2025 Q3 target for study completion**
- **Study deliverables will include model demonstrations, final report, and technical white paper**
- **Stakeholder engagement through 6 public information sessions:**
  1. (Today) Elicit stakeholder feedback on data, assumptions, and modeling plan including proposed demonstrations and scenarios;
  2. Demonstrate findings and challenges from data collected and processed thus far, and elicit stakeholder feedback on index development and user selections;
  3. Dig deeper on the proposed model demonstrations and scenarios, and elicit stakeholder feedback on the default indices for those model demonstrations and scenarios;
  4. Share initial model results and findings, and elicit stakeholder feedback on model strengths/weaknesses and needed immediate refinements and validations;
  5. Share draft model results, and elicit stakeholder feedback on implications to grid planning processes;
  6. Briefing on the final report.

# OVERVIEW OF KEY DATA SOURCES

# Industry initiatives towards quantifying resilience in grid planning

## 4-Pillar Methodology of Equitable Resiliency Evaluation and Planning

- I. **Baseline Assessment**
  - 1) Define geographical area
  - 2) Define load tiers or resiliency levels
  - 3) Identify minimum resiliency requirements
  - 4) Define hazards to consider
  - 5) Conduct assessment of vulnerabilities
  - 6) Results of resilience assessment
- II. **Mitigation Measure Assessment**
  - 1) Identify potential mitigation measures
  - 2) Assess ability of each measure to meet resiliency requirements
  - 3) Compare costs of each measure
- III. **Resiliency "Scorecard"**
  - 1) Resiliency Scorecard is a tool to assess resiliency
  - 2) Scoring reflects resiliency levels
  - 3) Scoring system provides fuel resources to meet the result in a higher "score"
- IV. **Resiliency Response Assessment**
  - 1) Conduct Baseline Assessment
  - 2) After Implementation of Mitigation Measures
  - 3) Assess achievement of resiliency requirements



### What is Social Burden

### Southern California Edison's Community Resilience Metric

SCE's Climate Adaptation and Vulnerability Assessment (CAVA)

- California's first CAVA, filed on May 13, 2022
- Analyzed impacts of changing climate patterns... on SCE's
  - Temperature
  - Precipitation
  - Sea level rise
  - Wildfire
  - Cascading events
- Assets
  - Operations
  - Services

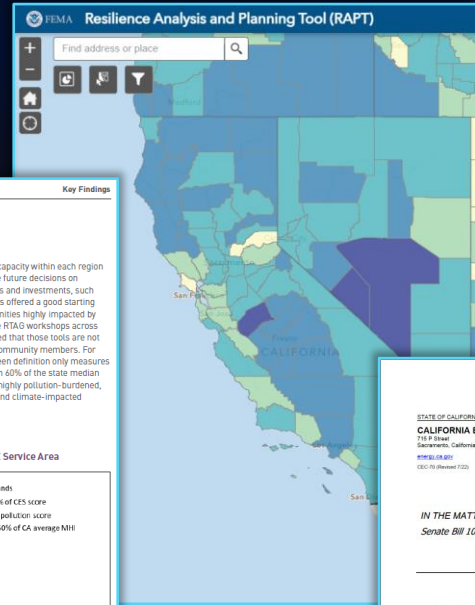
For CAVA, CPUC directed SCE to:

- Analyze how to promote equity
- Consult Disadvantaged and Vulnerable Communities (DVCs) in determining levels of adaptive capacity
- Allow Community Based Organizations (CBOs) and DVC members to participate in the vulnerability assessment

SCE utilized opportunity to develop unique methods to best meet CAVA goals

Developed equity tools in consultation with communities to help determine where adaptations need to be prioritized and what adaptations we would utilize

Near-term climate adaptation measures are requested in recently-filed 2025-2028 General Rate Case



### Resilient Together

#### Adaptive Capacity

The CPUC had directed the investor-owned utilities to target outreach DVCs, consistent with its Environmental and Social Justice Action Plan goals and Disadvantaged Community Advisory Group Guiding Principles. The project team consulted several tools to identify communities in PG&E's service regions that suffer most from economic, health, and environmental burdens, including the CalEnviroScreen, Census data, and the Baseline Resilience Indicators for Communities Index (BRIC<sup>2</sup>).

The project team utilized data sets to supplement RTAG and community input in developing a broader understanding of adaptive capacity within each region for PG&E to use to evaluate future decisions on climate resilience programs and investments, such as BRIC. Though these tools offered a good starting point for assessing communities highly impacted by climate hazards, during the RTAG workshops across all regions, members shared that those tools are not inclusive to many of their community members. For example, the CalEnviroScreen definition only measures census tracts with less than 40% of the state median income and those that are highly pollution-burdened, leaving many low-income and climate-impacted communities out.

Key Findings

FIGURE 1. Disadvantaged and Vulnerable Communities in PG&E Service Area

STATE OF CALIFORNIA — NATURAL RESOURCES AGENCY  
 CALIFORNIA ENERGY COMMISSION  
 715 P Street  
 Sacramento, California 95814  
 (916) 227-0100  
 (CC) (N) (Revised) (202)

Greg Newsum, Governor

IN THE MATTER OF:  
 Senate Bill 100 Joint Agency Report

DOCKET NO. 23-SB-100  
 NOTICE OF HYBRID WORKSHOP  
 RE: 2025 Senate Bill 100 Report Non-Energy Benefits Workshop

**Notice of 2025 Senate Bill 100 Report Non-Energy Benefits Workshop**  
**April 16, 2024**  
 9:30 a.m. – 4:00 p.m.

**In-Person at:**  
 Warren-Alquist State Energy Building  
 Rosenfeld Hearing Room, First Floor  
 1516 Ninth Street, Sacramento, California 95814  
 (Wheelchair Accessible)

**Remote Option via Zoom™** <https://zoom.us/>  
 Webinar ID: **833 6495 8165** and passcode: **387520**

The California Energy Commission (CEC), the California Public Utilities Commission (CPUC), and the California Air Resources Board (CARB) will conduct a joint workshop to discuss the approach and implications of examining the non-energy benefits and social costs of potential resource scenarios to meet Senate Bill (SB) 100 (SB 100, De Leon, Chapter 312, Statutes of 2018) targets.

This is a hybrid meeting with both a publicly accessible physical location and public access online or by phone through Zoom™.

The public can participate in the workshop consistent with the attendance instructions below. The CEC aims to begin promptly at the start time posted and the end time is estimated based on the proposed agenda. The workshop may end sooner or later than the posted end time.

Stanford University  
 Stanford | Doerr  
 School of Sustainability

News & Events

Power grid

## New research consortium seeks to help optimize future grid

With the support of the U.S. Department of Energy, a Stanford-led consortium of 22 research institutions seeks to help communities balance top priorities for a decarbonized grid.

February 21, 2024  
 By Mark Golden

f t i n e

EPRI

## Climate READi

Home Workrooms Affinity Group Sponsors Research Results Story Maps Climate 101 Events Announcements Links Related Research

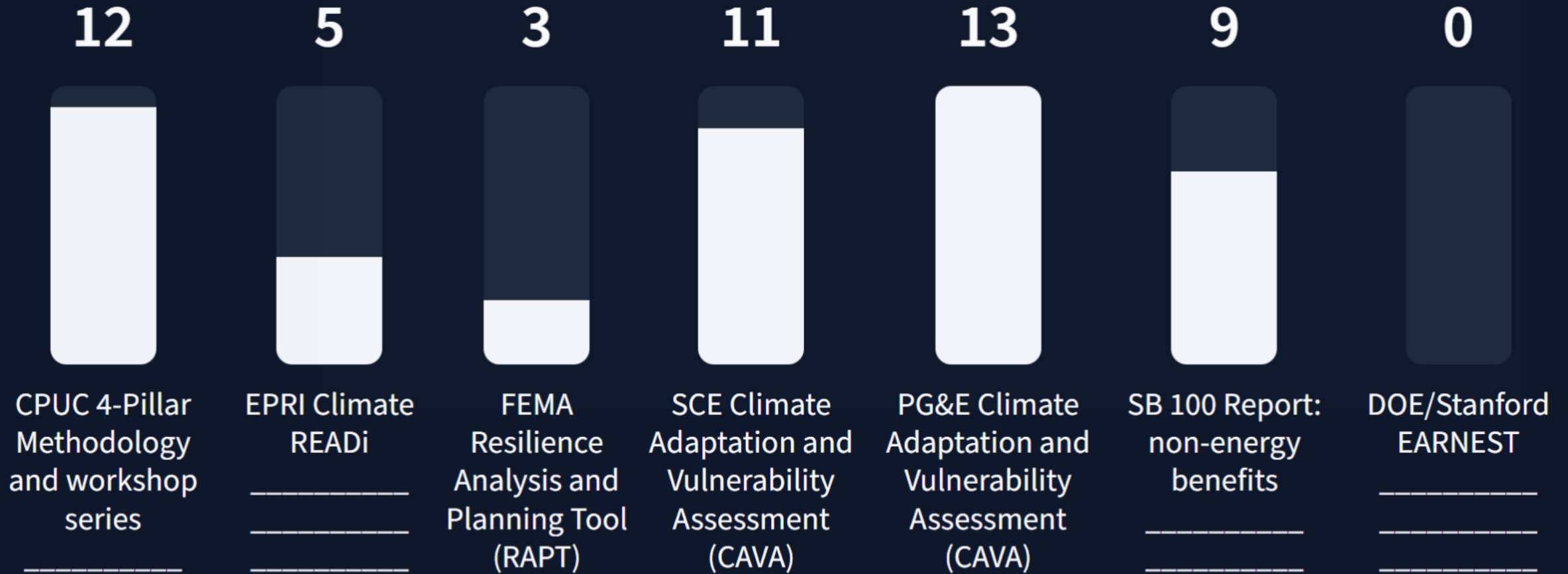
### Climate READi

As 1-in-50 or 1-in-100-year extreme events of the past increase in frequency, and society increasingly depends on electricity, EPRI is strengthening the power sector's collective approach to managing climate risk to the power system. And as the economy electrifies and decarbonizes, energy grid reliability and resilience will be paramount. Energy companies, regulators, policymakers, and other industry stakeholders require science-based insights about the future power system and the environment in which it will operate to identify potential adaptation and resilience investments. EPRI's collaborative model will convene the global thought leaders and scientific researchers necessary to build an informed and consistent approach.

For more information, please contact [ClimateREADi@epri.com](mailto:ClimateREADi@epri.com). To sign up for the Climate READi newsletter, click here.



# Which related **industry initiatives** are you familiar with? (select all that apply)

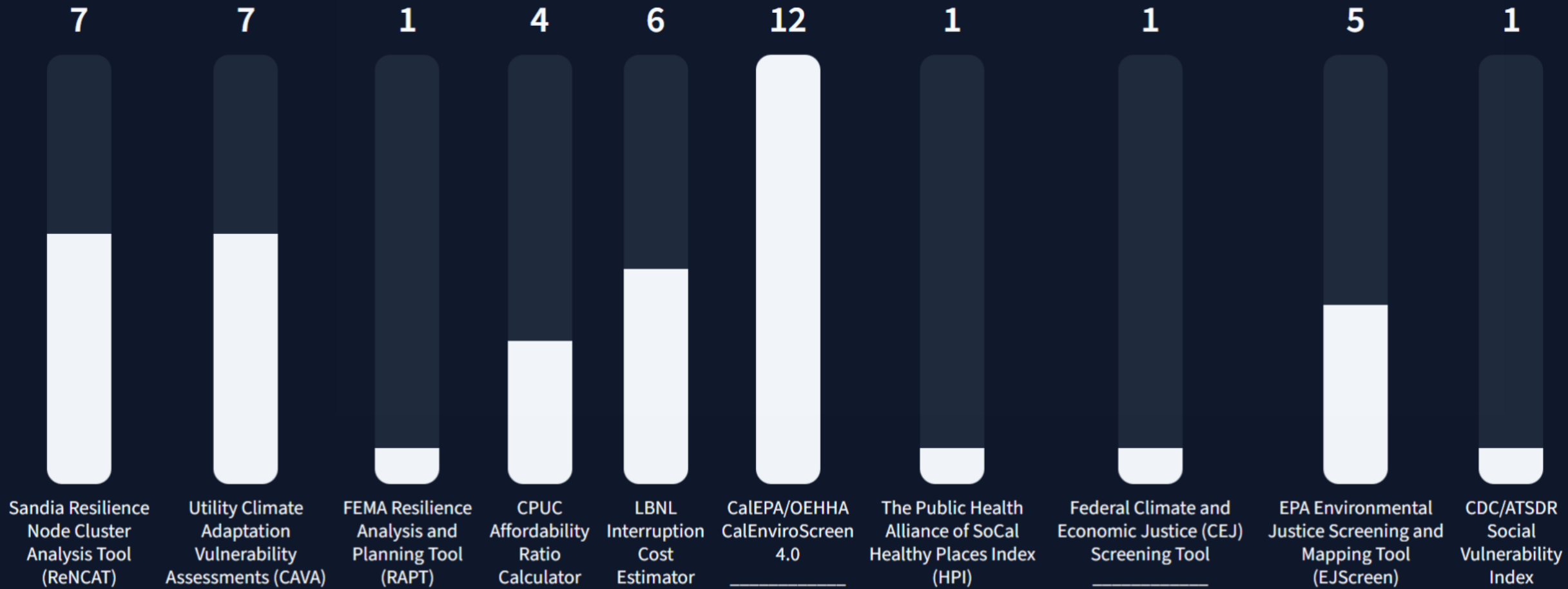


# Data review and collection

## In our data review and collection phase, what are we looking for?

- Specific indicators of vulnerabilities driving electricity outage impacts, for example:
  - Unequal access to essential services enabled by electricity, and to other resources—making outages more/less difficult to reduce, withstand, and recover from
  - Susceptibility to an emergency situation that compounds with outages (e.g., heat event and needing AC or fans); hazards that directly impact communities and people
- Data access, completeness, quality
- Approach integrating user preferences/selections
- Methodology for weighting preferred indicators into a composite resilience index
- Examples of effective GIS tools for decision support

# Which related **data sources** are you **MOST** familiar with? (select up to 4)



Please **upvote/downvote data sources** (up=relevant/useful to the study discussed today; down=not relevant/useful)

CalEPA/OEHHA CalEnviroScreen 4.0

👍 9 🗨️ 1



EPA Environmental Justice Screening and Mapping Tool (EJScreen)

👍 8 🗨️ 0



Sandia Resilience Node Cluster Analysis Tool (ReNCAT)

👍 7 🗨️ 0



Utility Climate Adaptation Vulnerability Assessments (CAVA)

👍 6 🗨️ 0



Federal Climate and Economic Justice (CEJ) Screening Tool

👍 5 🗨️ 0



FEMA Resilience Analysis and Planning Tool (RAPT)

👍 4 🗨️ 0



CPUC Affordability Ratio Calculator

👍 4 🗨️ 0



CDC/ATSDR Social Vulnerability Index

👍 5 🗨️ 1



LBNL Interruption Cost Estimator (ICE 2.0)

👍 3 🗨️ 0



The Public Health Alliance of SoCal Healthy Places Index (HPI)

👍 3 🗨️ 0





# Data sources (examples)

	<i>To learn more</i>	<i>Key resilience-related index/output</i>	<i>Key use of resilience metrics</i>
<b>Sandia Resilience Node Cluster Analysis Tool (ReNCAT)</b>	<a href="https://energy.sandia.gov/news/download-sandias-resilient-node-cluster-analysis-tool-rencat/">https://energy.sandia.gov/news/download-sandias-resilient-node-cluster-analysis-tool-rencat/</a> And as piloted with SCE: <a href="https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/resiliency-and-microgrids/resiliency-and-microgrids-events-and-materials">https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/resiliency-and-microgrids/resiliency-and-microgrids-events-and-materials</a>	Social Burden Index (SBI)	Guide outage mitigation resource planning across and within communities
<b>Utility Climate Adaptation Vulnerability Assessments (CAVA)</b>	SCE: AL 4793-E (May 13, 2022) PG&E: AL 7271-E (May 15, 2024) Federal BRIC: <a href="https://www.sc.edu/study/colleges_schools/artsandsciences/centers_and_institutes/hvri/data_and_resources/bric">https://www.sc.edu/study/colleges_schools/artsandsciences/centers_and_institutes/hvri/data_and_resources/bric</a>	SCE: Community Resiliency Metric (CRM) Community Impact Metric (CIM) PG&E: Federal BRIC index	Prioritize grid investments
<b>FEMA Resilience Analysis and Planning Tool (RAPT)</b>	<a href="https://rapt-fema.hub.arcgis.com">https://rapt-fema.hub.arcgis.com</a>	Community Resilience Challenges Index (CRCI) National Risk Index (NRI)	Emergency planning and preparedness
<b>CPUC Affordability Ratio Calculator</b>	<a href="https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/affordability">https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/affordability</a>	Affordability Ratio (AR)	Develop strategies to mitigate future energy rate increases
<b>LBNL Interruption Cost Estimator (ICE 2.0)</b>	<a href="https://icecalculator.com">https://icecalculator.com</a>	Value of Lost Load (VoLL)	High-level benefits to reliability improvements; wholesale market design
<b>CalEPA/OEHHA CalEnviroScreen 4.0</b>	<a href="https://oehha.ca.gov/calenviroscreen">https://oehha.ca.gov/calenviroscreen</a>	Composite burden score (CES Score)	Direct climate investments
<b>The Public Health Alliance of SoCal Healthy Places Index (HPI)</b>	<a href="https://www.healthyplacesindex.org">https://www.healthyplacesindex.org</a>	Healthy Places Index (HPI)	Direct health funding and efforts
<b>Federal Climate and Economic Justice (CEJ) Screening Tool</b>	<a href="https://screeningtool.geoplatform.gov">https://screeningtool.geoplatform.gov</a>	Disadvantaged Community designation	Guide programs targeting disadvantaged communities
<b>EPA Environmental Justice Screening and Mapping Tool (EJScreen)</b>	<a href="https://www.epa.gov/ejscreen">https://www.epa.gov/ejscreen</a>	EJ Indices (multiple)	Guide environmental protection policies and programs
<b>CDC/ATSDR Social Vulnerability Index</b>	<a href="https://www.atsdr.cdc.gov/placeandhealth/svi">https://www.atsdr.cdc.gov/placeandhealth/svi</a>	Social Vulnerability Index (SVI)	Prepare for and recover from public health emergencies



# Action needed:

## Please review the following references in preparation for Information Session #2:

- Industry initiatives (examples)
- Data sources (examples)
- Selected references
- Decision support tools (examples)

Information Session: Introduction to the CPUC Equitable Resiliency Study Hosted by the CPUC Grid Resiliency and Microgrids Team, Energy Division September 10, 2024 10:00 AM–12:00 PM Pacific	
<b>Industry Initiatives (examples)</b> Please review in preparation for Information Session #2	
	To learn more
CPUC 4-Pillar Methodology and workshop series	<a href="https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/resiliency-and-microgrids/resiliency-and-microgrids-events-and-materials">https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/resiliency-and-microgrids/resiliency-and-microgrids-events-and-materials</a>

<b>Data Sources (examples)</b> Please review in preparation for Information Session #2			
	To learn more	Key resiliency-related index/output	Key use of resiliency metrics
Sandia Resilience Node Cluster Analysis Tool (ReNCAT)	<a href="https://energy.sandia.gov/news/download-sandias-resilient-node-cluster-analysis-tool-rencat/">https://energy.sandia.gov/news/download-sandias-resilient-node-cluster-analysis-tool-rencat/</a> And as piloted with SCE: <a href="https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/resiliency-and-microgrids/resiliency-and-microgrids-events-and-materials">https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/resiliency-and-microgrids/resiliency-and-microgrids-events-and-materials</a>	Social Burden Index (SBI)	Guide outage mitigation resource planning across and within communities
Utility Climate Adaptation Vulnerability Assessments (CAVA)	SCE: AL 4793-E (May 13, 2022) PG&E: AL 7271-E (May 15, 2024)  Federal BRIC: <a href="https://www.sc.edu/study/college-hvri/data_and_resources/bric">https://www.sc.edu/study/college-hvri/data_and_resources/bric</a>	SCE: Community Resiliency Metric (CRM), Community Impact Metric (CIM)	Prioritize grid investments
FEMA Resilience Analysis and Planning Tool (RAPT)	<a href="https://rapt-fema.hub.arcgis.com">https://rapt-fema.hub.arcgis.com</a>		

<b>Selected Publications</b> Please review in preparation for Information Session #2	
Full citation	url
Aydin, Mariko Geronimo, and Cevat Onur Aydin. 2024. <i>California Public Utilities Commission scaling up and crossing bounds: energy storage in California</i> . Lumen Energy Strategy, LLC. Prepared for the California Public Utilities Commission. May 1, 2024. <a href="http://www.lumenenergystrategy.com/energystorage">www.lumenenergystrategy.com/energystorage</a>	<a href="http://www.lumenenergystrategy.com/energystorage">www.lumenenergystrategy.com/energystorage</a>
Brockway, Anna M., Jennifer Conde, and Duncan Callaway. 2021. "Inequitable access to distributed energy resources due to grid infrastructure limits in California." <i>Nature Energy</i> . September 13, 2021. <a href="https://doi.org/10.1038/s41560-021-00887-6">https://doi.org/10.1038/s41560-021-00887-6</a>	<a href="https://doi.org/10.1038/s41560-021-00887-6">https://doi.org/10.1038/s41560-021-00887-6</a>
CPUC Staff. 2020. Microgrids and resiliency staff concept paper. Pursuant to Senate Bill 1339 (2018) and R. 19-09-009. July 22, 2020. <a href="https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M344/K038/344038386.PDF">https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M344/K038/344038386.PDF</a>	<a href="https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M344/K038/344038386.PDF">https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M344/K038/344038386.PDF</a>
Dugan, Jesse, Dahlia Byles, and Salman Mohagheghi. 2023. "Social vulnerability to long-duration power outages." <i>International Journal of Disaster Risk Reduction</i> . 85 (2023) 103501. <a href="https://doi.org/10.1016/j.ijdrr.2022.103501">https://doi.org/10.1016/j.ijdrr.2022.103501</a>	<a href="https://doi.org/10.1016/j.ijdrr.2022.103501">https://doi.org/10.1016/j.ijdrr.2022.103501</a>
Sparto, Chelsi, Peter Larsen, and Tyler Huntington. 2023. <i>The value of sharing and consolidating critical community, electricity, and natural hazard information</i> . Lawrence Berkeley National Laboratory Electricity Markets & Policy Energy Analysis & Environmental Impacts Division. Prepared for the California Public Utilities Commission. August 2023. <a href="https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/resiliency-and-microgrids/resiliency-and-microgrids-events-and-materials/lbnldoe-data-sharing-reportaug20.pdf">https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/resiliency-and-microgrids/resiliency-and-microgrids-events-and-materials/lbnldoe-data-sharing-reportaug20.pdf</a>	<a href="https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/resiliency-and-microgrids/resiliency-and-microgrids-events-and-materials/lbnldoe-data-sharing-reportaug20.pdf">https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/resiliency-and-microgrids/resiliency-and-microgrids-events-and-materials/lbnldoe-data-sharing-reportaug20.pdf</a>

See the Excel file under today's meeting materials here:

<https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/resiliency-and-microgrids/resiliency-and-microgrids-events-and-materials>

# Selected references

Other CPUC Resiliency and Microgrids workshops and materials, including 4 Pillars Methodology:  
<https://www.cpuc.ca.gov/resiliencyandmicrogrids>

Also:

Aydin, Mariko Geronimo, and Cevat Onur Aydin. 2024. *California Public Utilities Commission scaling up and crossing bounds: energy storage in California*. Lumen Energy Strategy, LLC. Prepared for the California Public Utilities Commission. May 1, 2024. [www.lumenenergystrategy.com/energystorage](http://www.lumenenergystrategy.com/energystorage)

Brockway, Anna M., Jennifer Conde, and Duncan Callaway. 2021. "Inequitable access to distributed energy resources due to grid infrastructure limits in California." *Nature Energy*. September 13, 2021. <https://doi.org/10.1038/s41560-021-00887-6>

CPUC Staff. 2020. *Microgrids and resiliency staff concept paper*. Pursuant to Senate Bill 1339 (2018) and R.19-09-009. July 22, 2020. <https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M344/K038/344038386.PDF>

Dugan, Jesse, Dahlia Byles, and Salman Mohagheghi. 2023. "Social vulnerability to long-duration power outages." *International Journal of Disaster Risk Reduction*. 85 (2023) 103501. <https://doi.org/10.1016/j.ijdr.2022.103501>

Sparti, Chelsi, Peter Larsen, and Tyler Huntington. 2023. *The value of sharing and consolidating critical community, electricity, and natural hazard information*. Lawrence Berkeley National Laboratory Electricity Markets & Policy Energy Analysis & Environmental Impacts Division. Prepared for the California Public Utilities Commission. August 2023. <https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/resiliency-and-microgrids/resiliency-and-microgrids-events-and-materials/lbnldoe-data-sharing-reportaug20.pdf>

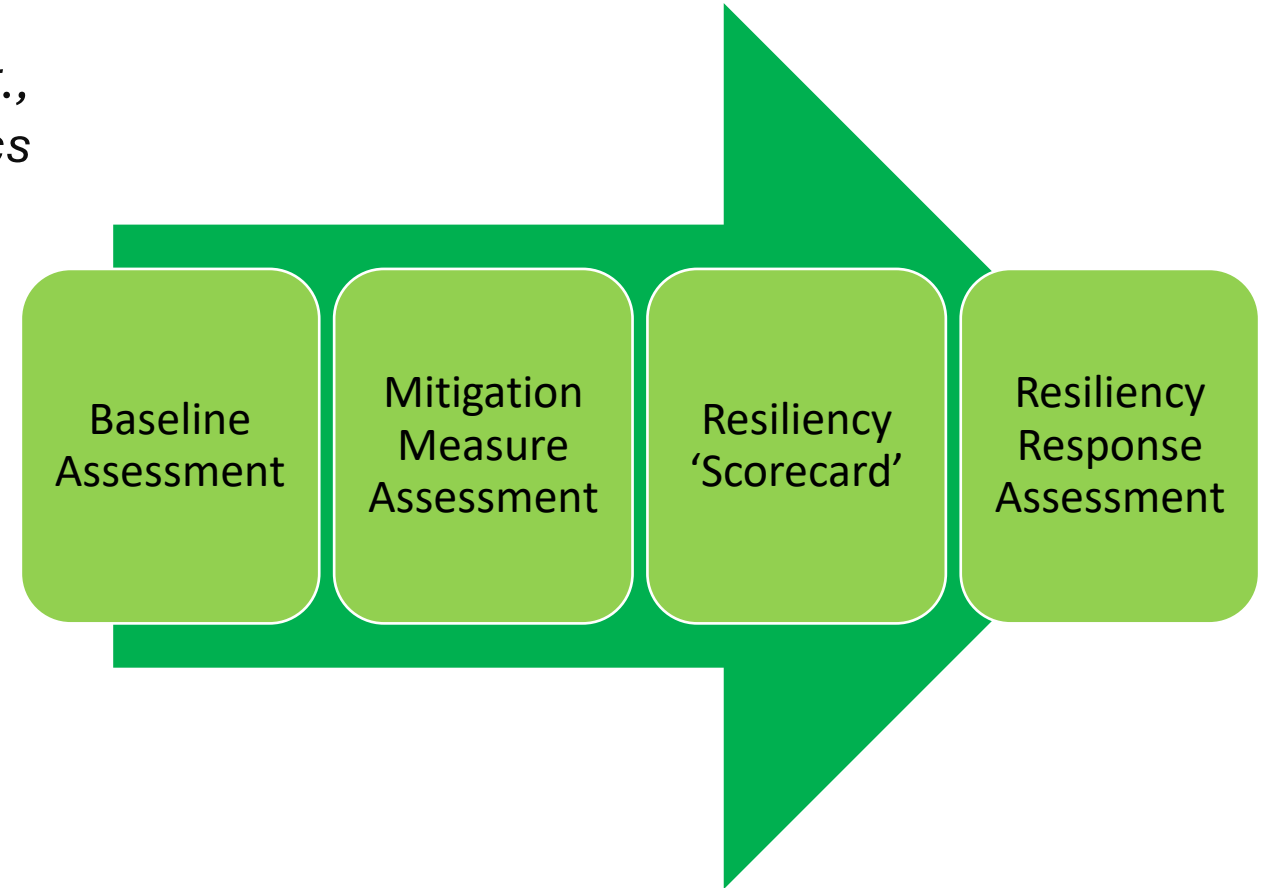
# EXAMPLES OF GEO-SPATIAL DECISION SUPPORT TOOLS AND INDICES



# Decision Support Tools for Equitable Resiliency Planning

## Objective - Support Needs of 4-Pillar Framework for Resiliency Planning

- *Customer Outage/Use Profiles (from WARP), e.g.,*
  - *Historic and projected outage characteristics*
  - *Customer use characteristics*
- *Community Resilience Profiles, e.g.,*
  - *Social Vulnerability*
  - *Economic*
  - *Preparedness*
- *Natural Hazards Exposure Profiles, e.g.,*
  - *Wildfire*
  - *Earthquake*
  - *Heat*
  - *Etc.*



# Examples of Decision Support Tools

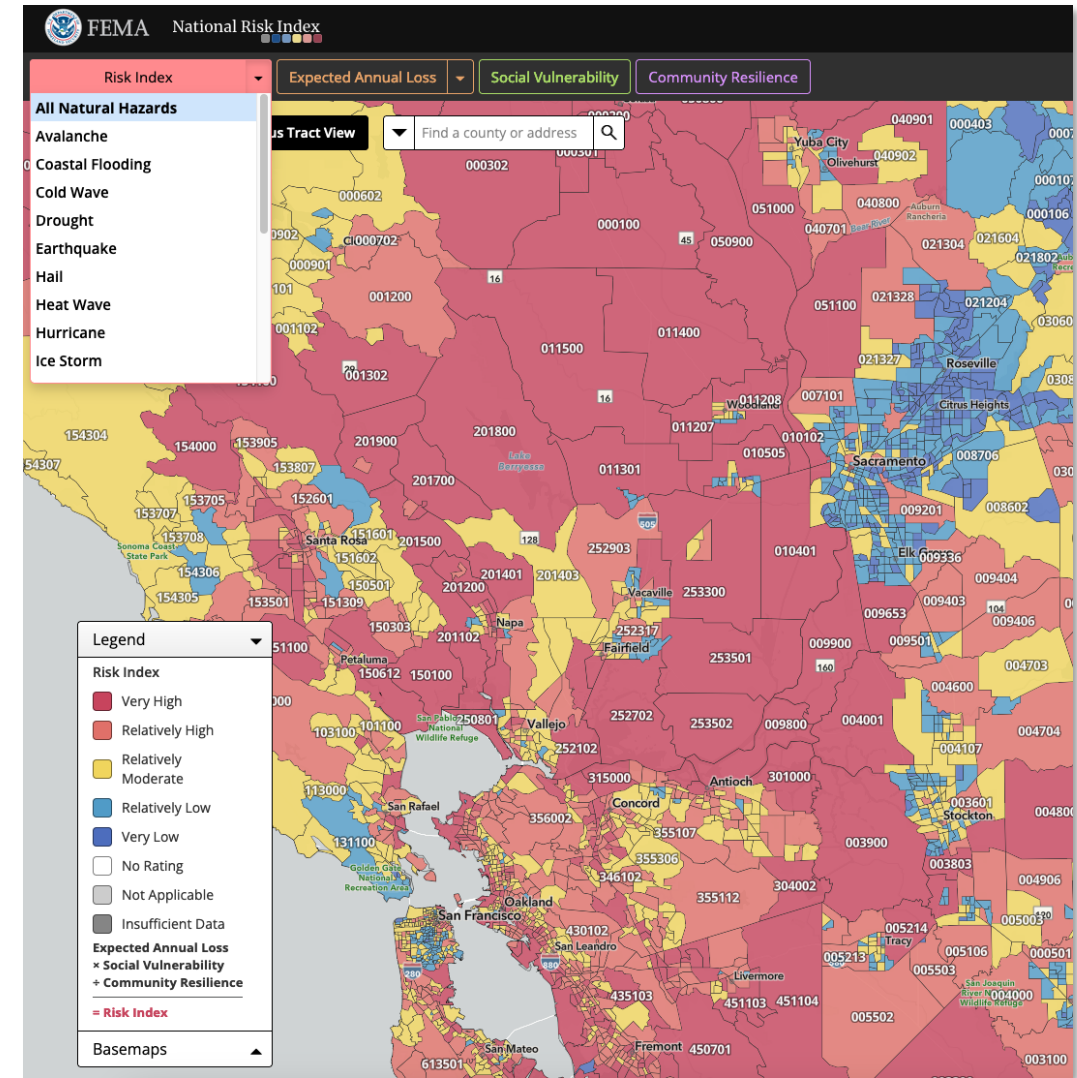
## FEMA National Risk Index

<https://hazards.fema.gov/nri/map>

- Leverages data for 18 hazards and risk factors for each U.S. County and Tract.

## Other examples:

- CDC/ATSDR Social Vulnerability Index (SVI)
- The Public Health Alliance of SoCal Healthy Places Index (HPI)
- US Forest Service - Wildfirerisk.org

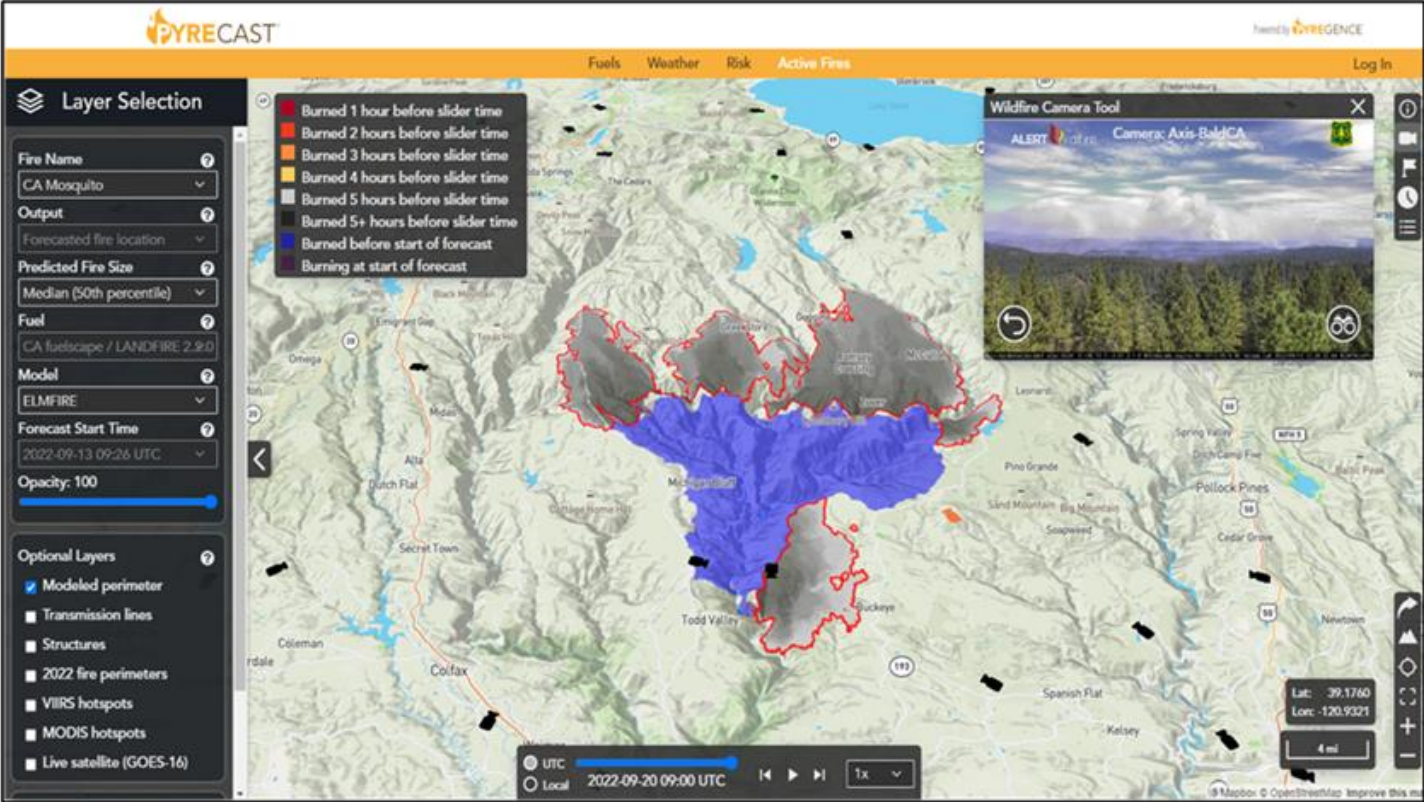
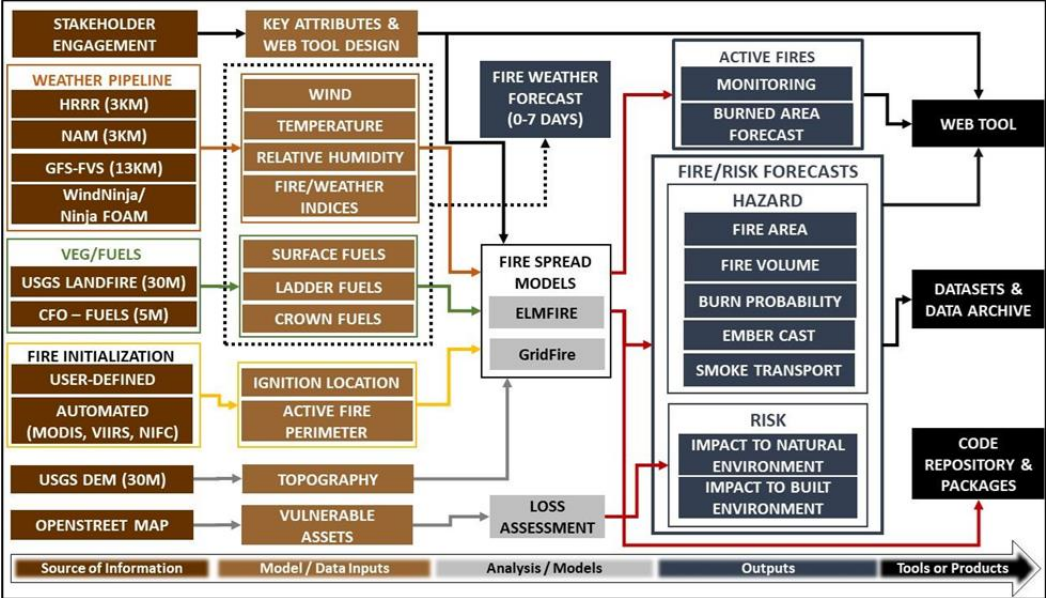


# Examples of Decision Support Tools

## PyreCast

<https://pyrecast.org/>

- Near-term fire forecast tool



# Examples of Decision Support Tools

## Planscape

<https://app.planscape.org/map>

- Landscape resiliency planning tool



# Planscape

**Planscape**  
← Planning Areas / New Plan

Map Control Panel  
Region: SIERRA\_NEVADA  
Data Transparency: [Slider]  
Map Views: MAP 1, MAP 2, MAP 3, MAP 4  
CLEAR ALL

- Fire-Adapted Communities
- Hazard
- Structure Exposure Score
- **WUI Damage Potential**
- Fire Dynamics
- Forest Resilience

START PLANNING: DRAW AREA, UPLOAD AREA

Legend:  
Percent: 100%, 50%, 0%  
Dry Weig: 400, 0  
Number: >60, 20

3 WUI Damage Potential

**Planscape** Shane Feedback  
← Planning Areas / SLT / SLT2

Scenario Name: SLT2

Structure Exposure Score

Project Area	Score
1	4.0
2	3.0
3	2.0

Heavy Fuel Load

Project Area	Avg Tons per Acre
1	1.6
2	1.4
3	1.4

WUI Damage Potential

Project Area	Damage Potential
1	2.0
2	2.0
3	1.0

California Spotted Owl Habitat

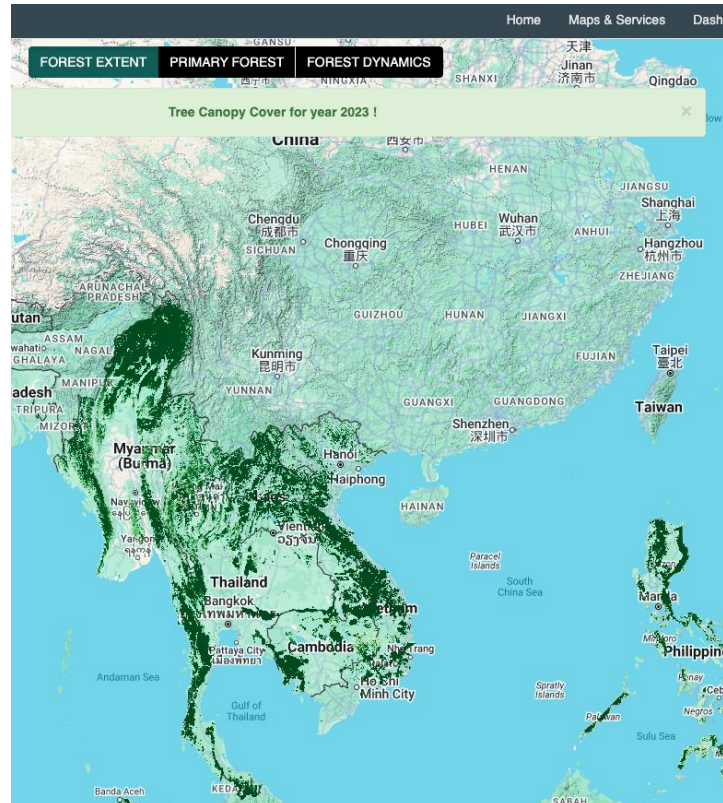
Project Area	Habitat (Acres)
1	1600
2	1200
3	800

Download Shape Files Download CSV data

# Examples of Decision Support Tools

The regional land cover monitoring system (RCLMS) and the forest monitoring system <https://landcovermapping.org/en/forest-monitor/>

- Leverages and disseminates open-source remote sensing data



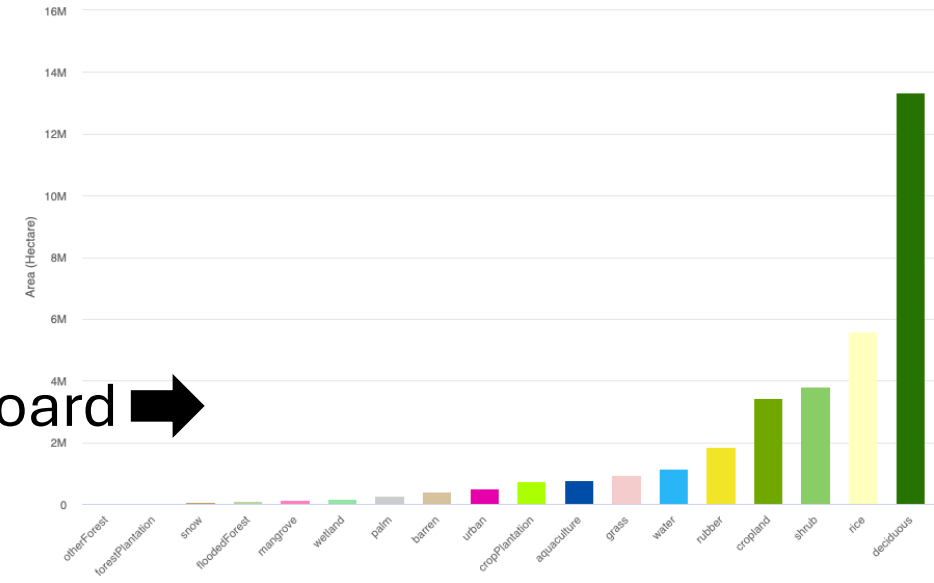
← Map Interface

## LAND COVER STATISTICS

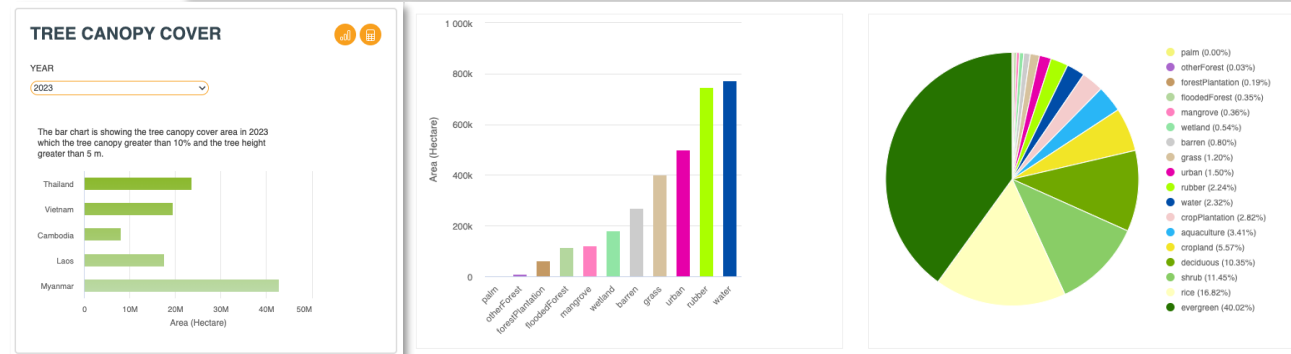
COUNTRY:  YEAR:



The below column chart is showing the total area each of the land cover classes in Vietnam in 2023



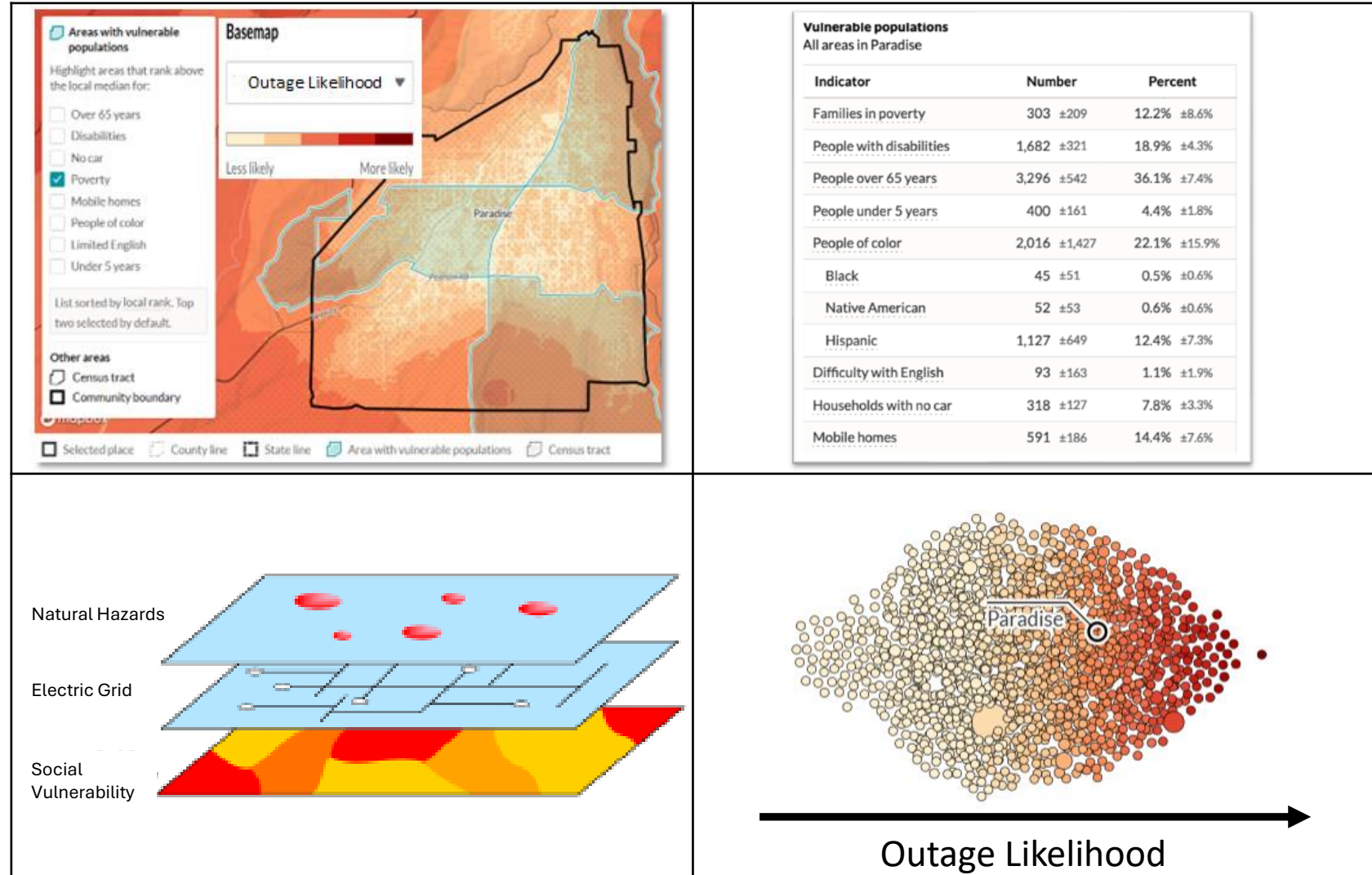
Dashboard →



# Tool Functions & Features: Concepts

- Maps & Overlays
- Graphics
- Tabular Summaries
- Reports
- Selectable Resilience Metrics
- Swipe Tool/Time Slider
- Interactivity

*(all diagrams are illustrative, for discussion purposes only)*



*Illustrative diagrams adapted from wildfirerisk.org and Dugan et al. (2023)*

# Action Needed:

## **In preparation for information session #2**

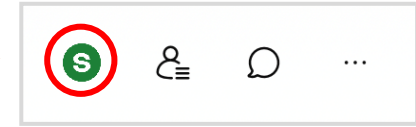
- Review the decision support tools from list provided; identify the tools you like best.
- From the decision support tools reviewed, what features and functions are appealing to you?
- What information and/or outputs are critical for the tool to provide and support your grid resiliency planning needs?

# Discussion and Q&A

## WebEx Tip

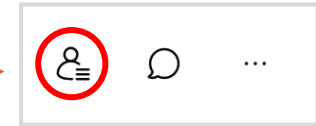
### Option 1:

Access the written Q&A panel here

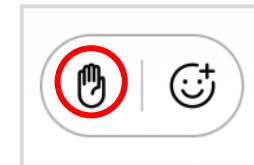


### Option 2:

1. Click here to access the attendee list and see who has raised their hand.



2. Raise your hand by clicking the hand icon.



3. Lower it by clicking again.



# Next Steps

- Please review the Excel file attached to today's meeting materials
  - In preparation for the next information session
- Information session #2: Demonstrate findings and challenges from data collected and processed thus far, and elicit stakeholder feedback on index development and user selections

## For more information:

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**Julian Enis**  
**Julian.Enis@cpuc.ca.gov**

**<https://www.cpuc.ca.gov/resiliencyandmicrogrids/>**

