California Public Utilities Commission

RESILIENCE WORKSHOP SERIES SUMMARY REPORT

REPORT PREPARED BY ENERGY DIVISION

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Acronyms

4-PM – 4-Pillar Methodology

CAVA – Climate Adaptation Vulnerability Assessment

CEC – California Energy Commission

CONE – Cost of new entry

CPUC – California Public Utilities Commission

CRM – Community Resilience Metric

CSE – Center for Sustainable Energy

DDOR – Distribution Deferral Opportunity Report

DOE – U.S. Department of Energy

EPIC – Electric Program Investment Charge

ESJ – Environmental and Social Justice

GHG – Green House Gas

GNA – Grid Needs Assessment

GRC – General Rate Case

ICE – Interruption Cost Estimate (calculator)

IEPR – Integrated Energy Policy Report

IOUs – Investor-Owned Utilities

IRP – Integrated Resource Planning

kW – kilowatt

LBNL – Lawrence Berkeley National Labs

LOLE – Loss of Load Expectation

LSE – Load Serving Entities

Lumen – Lumen Energy Strategy

OP – Ordering Paragraph

POET – Power Outage Economic Tool

PUC – Public Utilities Code

R.XX-XX-XXX – Rulemaking (followed by CPUC Proceeding number)

RAMP – Risk Assessment Mitigation Phase

RDF – Risk-Based Decision-Making Framework

ReNCAT – Resilience Node Cluster Analysis Tool

RMWG – Resiliency and Microgrids Working Group

RSE – Risk-spend efficiency

Sandia – Sandia National Labs

SB XXX – Senate Bill (followed by assigned bill number)

SBI – Social Burden Index

SCE – Southern California Edison

SCJCD – Sonoma County Junior College District

SDG&E – San Diego Gas & Electric

SERA – Site Equity Resiliency Analysis

S-MAP – Safety Model Assessment Proceeding

SRJC – Santa Rosa Junior College

WECC – Western Electricity Coordinating Council

Introduction

Resiliency is a term frequently used to describe a growing factor in how grid infrastructure investment and upgrade strategies should be deployed in the face of climate change and increased risks to the electric grid. However, while this term appears in public utilities code (e.g., PUC § 454.52, PUC § 8386) and increasingly in the scope of CPUC rulemakings (e.g., R.21-06-017 and previously R. 19-09-009), the CPUC does not yet have an established definition or standard of resilience that applies to grid planning and infrastructure investment processes. Furthermore, there is no official methodology for evaluating resilience as a grid service. Under the direction of Commissioner Genevieve Shiroma, Energy Division staff ("staff") sought to address these gaps by organizing a workshop series to explore resilience standards and potential definitions, advance the work on equitable resilience metrics to reflect those standards and definitions, and test these standards in practical applications that could be translated to existing processes regulated by the CPUC.

In May through August of 2021, over the course of eight Resiliency and Microgrids Working Group (RMWG) meetings, staff presented the "4-Pillar Methodology" (4-PM) as a guiding framework and holistic process for examining how to increase equitable electric resiliency. The 4-PM examines resiliency in a sequential, scalable and iterative manner that evaluates solutions to challenges ranging from the individual project up to the grid-planning level. With this methodology, staff is building on current processes with operating tools that aid in identifying what regulatory actions would be necessary to advance such resiliency. A summary of the 4-PM is below.

Out of this workshop series, staff identified several complex issues as needing further exploration. Staff organized a work plan to address these areas and leveraged the expertise of many partners to accomplish the goals of that plan. The result was a second series of nine workshops held from May 2022 through November 2023 exploring the more complex aspects of equitable resiliency evaluation and planning through practical applications. A summary of these workshops, the key takeaways and lessons learned are covered in this report.

The 4-Pillar Methodology

Staff provided an overview of the 4-Pillar Methodology to stakeholders on May 5, 2021. Links to those presentations and recordings can be found here.

In general, the 4-PM covers the following:[1]

- Pillar 1: Baseline Assessment – Within the geographic boundaries being considered, what and where are critical, priority and discretionary electric loads? What is the likelihood and frequency of hazards threatening those loads currently and in the future? How has the current infrastructure performed in supporting those loads? (E.g. in the grid planning use case, load analysis and risk assessment are done within such processes as the California Energy Commission's (CEC) Integrated Energy Policy Report (IEPR), Distribution Deferral Opportunity Report (DDOR), Grid Needs Assessment (GNA) and Risk Assessment Mitigation Phase (RAMP), but these processes do not explicitly consider resiliency.)

[1] Links to the specific workshops that discussed each Pillar in depth are provided.

- Pillar 2: Mitigation Measure Assessment – What mitigation measures are available that optimally meet our goals (resiliency, Green House Gas (GHG) emissions, reliability, affordability, universal access) and what are the relative costs of those mitigation measures compared to their benefits? Over what timescale are those costs and benefits being measured? (E.g. in the grid planning use case, mitigation measure assessment is done within processes such as the Climate Adaptation Vulnerability Assessment (CAVA), RAMP, and General Rate Case (GRC), but these processes do not explicitly consider resiliency).
- Pillar 3: Resiliency Scorecard – What resiliency benchmarks do the mitigation measures cover? Example benchmarks are prioritized load, duration of resilience, fuel availability, GHG emissions, and blue-sky services. (E.g. in the grid planning use case, resiliency scoring would be represented by Integrated Resource Planning (IRP) portfolio evaluation process, but this process does not explicitly consider resiliency).
- Pillar 4: Resiliency Assessment – This represents identified metrics and an iterative process to be in place to assess the effectiveness of resiliency investments and identify improvements in the achievement of higher benchmark levels. (E.g. in the grid planning use case, resiliency assessment is represented by the GRC cycle, but this process currently does not explicitly consider resiliency).

Taken together, the 4-PM forms an overarching framework that can identify resiliency needs and provide a regulatory approach to how to meet those resiliency needs equitably, with least-cost best-fit solutions, while maintaining safety, reliability, affordability and universal access.

Driving Issues in Grid Resiliency

The following issues were identified in the RMWG meetings as areas of complexity within the 4-PM that needed further exploration. Staff pursued several partnerships coordinated with stakeholders to develop approaches to the following four issues and related questions:

1. **Economic and Equity Impacts/ Environmental and Social Justice (ESJ)**: Should the Investor Owned Utilities (IOUs) be required to assess the direct and indirect economic and equity impacts on customers experiencing major disruptive events that may impact delivery of energy services? To what extent should resiliency valuation decisions explicitly support environmental and social justice communities and align with the ESJ Action Plan?
2. **Resiliency Standards**: Which standard definitions, metrics, tools, and/or methodologies the Commission should adopt for assessing the impacts of major disruptive events and evaluating the efficacy of ratepayer investments in mitigating those impacts?
3. **Grid Planning and Investment**: How do these economic and equity impacts inform grid planning and investment decision-making?
4. **Coordination Across the Public Entities**: Whether rules should be adopted or modified to enhance bi-directional, multijurisdictional collaboration between IOUs, tribes, and government agencies on emergency plans, all-hazard mitigation plans, resiliency plans, or grid investments?

These issues, and the partnerships that helped explore them through practical applications of the 4-PM, were presented and discussed in a series of workshops held between May 2022 through November 2023. What follows is a description of each workshop organized by issue area.

Workshop Series

Issue #1: Economic and Equity Impacts/ Environmental and Social Justice

Staff collaborated with the National Labs to explore existing and in-development tools that generate metrics reflecting regional economic and local social burden impacts of long-duration power outages to assess direct and indirect costs and resiliency values.

Workshop title: "Economic and Equity Impacts of Large Disruptions – ICE Calculator and POET"
Date: May 10, 2022
Project partner: Lawrence Berkeley National Labs (LBNL)

LBNL's Interruption Cost Estimate (ICE) Calculator and its sister tool, the Power Outage Economic Tool (POET), are two tools being updated (ICE) and developed (POET) to reflect more accurately economic and wealth disparities and long duration impacts on aggregated residential, commercial, and regional economic levels. These tools were the focus of this workshop, where presentations explored stakeholder thoughts on the topic of outage-related social burden impacts.

Key Takeaways/Lessons Learned:

- Utilities across the country have been using the ICE calculator to reflect loss of load.
- The ICE calculator is survey-based, and the surveys are from 2012. LBNL explained that it was looking for utilities across the country to take part in a project to update the surveys, which would also add new information collection on long duration outages (> 16-24 hrs.), people's new experience with recent large scale electricity disruption events, and the ability to analyze the information to understand varying customer class experience. Participating utilities could add customizing parameters reflecting locationally significant data collection.
- Each participating organization would have at least one staff member sitting in on the Project Advisory Committee to ensure the update is transparent and comprehensive.
- Subsequent to this workshop, CPUC's S-MAP proceeding R.20-07-013 issued Decision 22-12-027 adopting the ICE calculator as a prime metric for Loss of Load Expected (LOLE). In Ordering Paragraph (OP) #2.b,[2] the Commission ordered the IOUs to use the current version of the ICE calculator to determine a standard dollar valuation of electric reliability risk for the Reliability Attribute used in the Risk-Based Decision-Making Framework (RDF). OP #2.b also ordered the IOUs to take part in LBNL's national project to update the calculator.

Workshop title: "The Social Burden Index (SBI) and the Resilience Node Cluster Analysis Tool (ReNCAT)"
Date: July 7, 2022
Project Partner: Sandia National Labs (Sandia)

Sandia's ReNCAT tool results in a Social Burden Index (SBI) reflecting indirect and non-monetized impacts of power disruption at a granular customer level. This workshop presented a deep dive into the ReNCAT tool, discussing the kinds of data layers and algorithms used in this publicly accessible tool that provides a potential metric reflecting equity considerations during grid outages. The presenters

[2] Decision 22-12-027, Ordering Paragraph #2.b.
https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M500/K014/500014668.PDF

explained the various levels of use of the ReNCAT tool (evaluative, optimization of mitigation measure placement to reduce social burden).

The ReNCAT tool came out of the need to promote energy justice, equity, affordability, and accessibility to services needed to meet the basic needs of those impacted by large scale electric power disruptions. Energy is used as an enabler of services, so the ReNCAT tool uses data that reflects the function of services in a geographical area that meets people's basic needs during power disruption. The ReNCAT tool looks to quantitatively measure access to these services by data layers reflecting availability and distribution of services, transportation, and social capacity to access the services.

Key Takeaways/Lessons Learned:

- When looking at critical services, the data considered reflects community accessible services that are operational (not those performing within the home).
- Ability is evaluated using household median income by census block, although there are no limits to the granularity of the analysis.
- The current tool uses the "Euclidian crow fly" to calculate distance. Improvements to the tool might take into account transportation routes and trip chaining.
- Medical Baseline customer data can be integrated into the analysis, but limitations due to non-enrollment and/or confidentiality can limit the granularity and accuracy of this population in the data.

Workshop Titles: "SCE and Sandia National Labs, ReNCAT Pilot Partnership Project Kickoff" and *"SCE and Sandia National Labs, ReNCAT Pilot Partnership Project Final Report"*

Dates: July 26, 2023, and November 28, 2023
Project Partners: Sandia National Labs (Sandia), Southern California Edison (SCE)

In these informational sessions, SCE and Sandia described the preparation for (July 2023 session) and results of (November 2023 session) their pilot partnership project. The project used SCE's Community Resilience Metric (CRM) and other utility and publicly sourced data as inputs to Sandia's ReNCAT to examine evaluative levels of social burden during blue and black sky conditions[3]. Social burden (discussed in previous workshops) is an indicator of how hard people are working to get their basic needs met during an electric power outage. Funding for the project came from the U.S. Department of Energy (DOE).

In July 2023, when introducing the pilot project, Sandia and SCE reported on their work preparing integrated utility infrastructure data along with SCE's CRM into Sandia's ReNCAT tool. The presenters described how the CRM served as a proxy for data Sandia had previously used to reflect "ability" to provide or travel to services needed during black sky conditions. Scenario development to test black sky conditions was also discussed, as well as considerations such as how to work with geographical challenges such as large swaths of national forest where critical services would not naturally be located.

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[3] "Blue sky" is defined in the workshop presentation as the state of the world when the power grid is fully operational and all facilities in existence are powered. They are assumed to be providing full service to people. "Black sky" is defined in the workshop presentation as a situation in which certain parts of the grid lose grid power. All facilities within that outage area are no longer powered and stop providing services. All facilities outside of the outage area continue to be powered and continue to provide services at their baseline levels.

In November 2023, Sandia and SCE reported on the results of the pilot project. The report includes geospatial depiction of social burden compared across full electrical service and hypothetical outage scenarios. The differential between social burden depicted in blue and black-sky scenarios measures the impact of selected (modeled) threats. Overall, although the eight selected outage scenarios impacted critical facilities, there was enough electric system redundancy across the study area that social burden did not increase by more than 10% in any one census block group within the study area. The CRM provided a richer, more nuanced look at differences in community attainment factors[4]. While quantifying social burden at the scale of a large utility is a non-trivial task, open-source data and computational tools make the task possible. In this Phase 1 study, social burden analysis considered each outage as a steady state problem. Also, in this particular study, backup generation resources were not considered in the analysis. Future research can explore how outage duration impacts social burden, and how non-resilience or equity-focused investments contribute to grid resilience.

Key Takeaways/Lessons Learned:

- People (population), people's social capacity (CRM), facilities, and services are not distributed evenly across the SCE service territory.
- Areas with lower underlying social capacity (lower CRM) and less service availability see greater increases in social burden in response to outages – even if they are located further away from those outages.
- Areas with higher underlying social capacity (higher CRM) and much higher service availability see less of an increase in social burden in response to outages – even if they are much closer to the outage areas.
- Rural areas may have more community preparedness (reflected by CRM) and thus may have more resiliency and less social burden, even though facilities and services may be longer distances away.
- The SBI can be used at a grid planning level to understand the effectiveness of an investment portfolio to reduce impact to a community of a large-scale electrical disruption (Climate adaptation-oriented investments or IRP portfolio evaluation).
- The SBI could be used for ranking and/or prioritizing areas within the broader service territory to target equity and resiliency-based projects, or best siting of resilience investments to reduce outage impacts.
- Driving down blue-sky social burden is not within the jurisdiction of the utility. However, these results could be used by other planning authorities to determine infrastructure siting and the prioritization of critical service access.
- Social burden is a key input to further levels of analysis provided by ReNCAT, such as its ability to function as an optimization software that can be used as a decision support tool to identify load shedding, backup generation purchases, microgrid formation, and line hardening investments that can reduce social burden at least cost.
- This resilience metric could provide the equity perspective needed to address equity in resilience when considering the practical application of the CAVA reports that describe the IOUs'

[4] The "community attainment factor" is a quantitative measure of some proxy variable that accounts for the key aspects of vulnerability and/or capacity, that make obtaining critical services more difficult for some members of the community than others.

climate adaptation strategies and how that analysis can inform the broader planning process, such as the IRP process and the GRCs, where the generation and distribution infrastructure is planned, and cost recovery is proposed. This metric would allow decision-makers to understand whether the IOUs' proposed investments are the least-cost, best-fit solutions to climate hazards and whether they are equitably sited and constructed.

Issues #2 and #3: Resiliency Standards and Grid Planning and Investment

The workshops under these driving issues explore resiliency standards such as definitions, metrics, tools, and methodologies most useful to adopt for assessing the impacts of major disruptive events and evaluating the efficacy of ratepayer investments in mitigating those impacts in the grid planning and investment decision-making process. The first three workshops focused on resiliency standards and planning considerations using grid-scale applications as the use case. The last two workshops focused on using the 4-Pillar Methodology to apply resiliency definitions and metrics to a utility in-front-of-the-meter use case and a behind-the-meter campus use case.

Workshop title: "Resiliency Standards - Resiliency Definitions" (1st of series of 3)
Date: March 21, 2023
Project Partner: Lumen Energy Strategy (Lumen)

This workshop was the first of three conducted with Lumen Energy Strategy, a CEC Electric Program Investment Charge (EPIC) grantee working on developing new inputs, assumptions, and tools to capture the impacts of climate change on electricity supply and demand in California.[5] This effort includes establishing a formal definition of resilience; re-parameterizing inputs to California electricity system planning models to reflect the impact of projected climate patterns and environmental extremes on electricity supply, demand, and the resulting resilience of electricity service to ratepayers; creating a loss-of-load resilience evaluation model; and evaluating the resilience of state resource planning output portfolios, including IRP portfolios selected by the CPUC and portfolios highlighted in the Joint Agencies' SB 100 studies. Lumen and the CEC agreed to work with CPUC staff to provide these information sessions that complement the resiliency work of the Grid Resiliency and Microgrids Team.

In the session "Resiliency Standards – Resiliency Definitions", the presenters highlighted key resilience concepts and elements of a resilience definition, and identified what aspects of resilience should be defined more specifically in order to apply the IRP use case.

Key Takeaways/Lessons Learned:

- Public Utilities Code Section 454.52(a)(1)(H) requires Load Serving Entities (LSEs) to file an integrated resource plan that, among other things, "strengthen[s] the diversity, sustainability, and *resilience* of the bulk transmission and distribution systems, and local communities."
- There are no CPUC-established standards or definitions of "resilience" applied in the CPUC's IRP portfolio review process. Across the Western Electric Coordinating Council (WECC) region, only two of the 20 utility IRPs reviewed by Lumen defined resilience, distinguished it from reliability and worked toward developing scope/analytics to incorporate resilience evaluation into their respective IRP frameworks.

[5] Lumen's EPIC project, EPC-22-001, is titled "Advance California's Electricity Resource Planning Tools to Assess and Improve Climate Resilience".

- In this workshop, Lumen Energy Strategy discussed what should be considered in determining a working definition of resilience such that the definition could guide improvements and how to quantitatively demonstrate that improvement in their respective plans.
- Key elements of a resilience definition were discussed:
  - The critical function or service that must be preserved is electricity service to end use customers, even under emergency conditions, with some prioritization needed (e.g. critical and priority loads).
  - The system providing that function/service is the electricity grid including all grid domains from fuel supply to end use customer.
  - Key hazards and failure points that can disrupt the system's ability to provide those functions/services should be identified on appropriate geospatial levels to reflect the risk tolerances of those who would be impacted by this disruption.
- The scope/maturity of how the term "resilience" is discussed in most IRPs varies significantly across the WECC, though climate change and adaptation needs are increasingly recognized in most IRPs.

Workshop Title: "Resilience Standards: Resilience Metrics" (2nd of series of 3)
Date: September 5, 2023
Project Partner: Lumen Energy Strategy

In this second informational session, Lumen presented and facilitated discussions exploring resiliency metrics and how these metrics may be applied to integrating resiliency in a broader grid planning perspective by applying the concepts to the current IRP process. Participants took part in talking through two use case scenarios examining outage impact dimensions using historical data that identified outage characteristics (footprint, duration and frequency) and customer type (equity, residential/commercial industrial sectors and critical vs. non-critical load type as identified through retail tariffs, billing, and meter data). Presenters then discussed how value stacking of system and local services might reduce net cost to provide resilience, impacting the economic feasibility and ranking of mitigation measures needed for resilience.

Key Takeaways/Lessons Learned:

- With a bird's eye view on system needs, IRP is uniquely positioned to incorporate resilience into the LSEs' planning processes by facilitating more dialogue with local perspectives on:
  - How to identify and model specific resilience vulnerabilities and failure points, geographies, and weather-specific situations
  - How to consider the whole grid for solutions with more planning integration across multiple grid domains[6]
  - How to evaluate value stacking opportunities, including upstream benefits of resilience investments and synergies to reduce net cost of resilience solutions
- Resilience improvement is a function of changes in outage characteristics and types of customers/communities most impacted by outages.

[6] The term "grid domain" is defined in D. 13-10-040, which says "Thus, in the Storage Framework, we utilize the term 'Grid Domain' to identify the different points of interconnection to the electric grid," then grid domains are labeled as "transmission-connected," "distribution-connected," or "customer-sited" (under "Behind-the-Meter") (pp. 13-15). https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M079/K533/79533378.PDF

- Poll participants mostly agreed that the key issue is interruption of electricity service to customers, and that not all outages are equally impactful—but some disagreed on scope of key failure points and hazards.
- The type of customer impacted, type of service provided during an outage, outage duration, outage footprint, and situational multipliers (e.g., heat waves) ranked relatively high in impacts to accessibility to critical services. Socioeconomic factors, outage notice & frequency, demographics, geographic isolation, and other factors are also perceived as multipliers on outage impacts.
- Cost effectiveness of resilience investments:
    - "High cost" is identified as one of the top barriers to effective resilience investments, among stakeholders in our first workshop.
    - Economic assessment of resilience plans and investments must consider both: (a) the degree of resilience improvement, and (b) net cost of achieving that amount of resilience improvement. This can be addressed by metrics combining key features of net cost of new entry (CONE)[7] and risk spend efficiency (RSE)[8].
- Value stacking examples showed how residual risk of outages needs to be weighed against value gained.

Workshop Title: "Resilience Standards: Resilience Methodologies" (3rd of series of 3)
Date: November 8, 2023
Project Partner: Lumen Energy Strategies

In this third informational session, Staff provided an overview of the current IRP process, and Lumen facilitated discussions exploring potential opportunities for local authorities, community leaders, load-serving entities, and state regulators to integrate resiliency into the broader grid planning perspective, with a focus on IRP.

Key Takeaways/Lessons Learned:

- Lumen highlighted opportunities to integrate local perspectives into the IRP process. Resilience needs, unlike IRP objectives (e.g., maintaining system reliability, reducing GHG emissions), are highly locational, and resilience solutions must address customer-level outages and impacts.
- LSEs are uniquely positioned to bridge the local/IRP knowledge gap by integrating local concerns, needs, and priorities into the IRP process through connection with local authorities who may have a more localized understanding of resilient grid concerns, needs and priorities.
- LSE IRP filings could provide the CPUC and stakeholders findings on local resilience risks/concerns and how LSE plans mitigate these concerns.
    - Narrative template could include a section for LSEs to demonstrate how their plans will improve resilience, describing engagement with local authorities, information collected, analytical approach/assumptions, and resilience impact metrics.

[7] Net Cost Of New Entry (CONE) is the amount of Resource Adequacy capacity revenue that a resource would need to support its initial investment. Calculated as levelized capital and Operations & Maintenance costs minus non-capacity benefits, typically shown in $ per kW-month.
[8] Risk Spend Efficiency (RSE) is used by utilities to quantify and compare cost effectiveness of mitigation measures based on the ratio of the risk reduction to the mitigation cost.

    - Resource data template could include a list of resources that are planned for resilience, their attributes, and availability profiles (resilience vs. grid).
- Lumen described how the CPUC could re-optimize the resource portfolio in IRP to consider capacity and grid availability of distributed resources.
- Lumen suggested that, as a part of the aggregation of LSE plans, IRP could also conduct a system-level resilience assessment of the aggregated resource portfolio, with a standardized set of metrics on resilience impacts by location. Circuit-level interruptions demonstrate the wide range of customer experiences with reliability and resilience of electricity service. Vulnerability indicators also show a wide range of potential impacts of resilience events (e.g., SBI, CAVA)

Workshop Title: "Resiliency Planning and Evaluation - 4-Pillar Methodology Use Cases: SDG&E and SCJCD"
Date: October 19, 2023
Project Partners: San Diego Gas & Electric (SDG&E) and Sonoma County Junior College District (SCJCD)

SDG&E and SCJCD discussed how the 4-Pillar Methodology can be used for resiliency planning in two different use cases. SDG&E demonstrated an in-front-of-the-meter utility use case application of the 4-Pillar Methodology to successive iterations of their Borrego Springs microgrid. SCJCD demonstrated a behind-the-meter campus use case as it applies to their long-term resiliency planning including, but not limited to, their onsite microgrid.

SDG&E: Borrego Springs is a utility-owned microgrid that has undergone recent upgrades and additions to improve certain aspects of resiliency and performance. Staff asked SDG&E to apply the 4-Pillar methodology in their planning process as a "proof of concept."

SCJCD: In early 2022, SCJCD asked if they could use the 4-Pillar methodology as a guide toward achieving a more robust set of resilience goals on their Santa Rosa Junior College (SRJC) campus. Their presentation in a workshop would demonstrate the application of the 4-Pillar methodology as a guiding set of considerations in an iterative process of assessing resilience goals and achievements and evaluating the benefits of additional investments in this behind-the-meter microgrid project.

Key Takeaways/Lessons Learned:

- 4-PM can be customized for each use case, and not all steps of the methodology will be applicable to each mitigation solution.
- Having detailed narrative descriptions for each step in 4-PM and templates to follow would improve its user experience.
- The Resiliency Scorecard (Pillar 3) could benefit from further refinement such as accounting for lower GHG emissions with updated technological solutions and adding the accounting for a personnel requirement for crossover/islanding functions (e.g., does personnel need to be onsite vs. remote control).
- SDG&E acknowledged that it could make a good comparative analysis of the resilience performance vs. goals using the 4-PM.
- Center for Sustainable Energy (CSE) has developed a tool, Site Equity Resiliency Analysis (SERA), to aid in modeling and sizing distributed energy equipment for microgrid development that takes equity metrics into account.
- Campus-level analysis using 4-PM can incorporate load prioritization of buildings and services allowing for future electrification plans and can help develop building standard specifications

around adaptation and resiliency including energy efficiency actions that reduce resilience requirements.
- Pillar I is most important to do methodically, considering future building and use changes, prioritization changes (residential buildings vs delivery of educational services vs campus infrastructure support buildings), and the function as well as duration of services to support.
- Cost breakdowns highlighting curtailment costs, while operation and outage scenarios contribute to identifying the most cost-effective mitigation measures that protect against most likely hazard scenarios.
- Improved communication with the county and district regarding Hazard Mitigation Plans and District Emergency Management protocols/procedures would help campus decision-making.

Issue #4: Coordination Across the Public Entities

A standardized approach to developing and sharing data across multi-jurisdictional public entities is a critical component of resiliency planning. Standardizing data exchange will allow jurisdictions and infrastructure managers to more quickly and efficiently build a shared understanding of the hazards they face together. Through a DOE Technical Assistance grant, LBNL explored how to integrate Local and Tribal Government Resilience planning (as represented in Local Hazard Mitigation Plans, Climate Adaptation Plan, or other similar plans) into broader grid planning processes.

Workshop title: "Grid Resiliency Planning and Coordination Across Public Entities - Information Session"
Date: August 22, 2023
Project partner: Lawrence Berkeley National Labs (LBNL)

In this informational session, LBNL discussed the discovery and data collection work done and resulting data schema produced as part of a DOE Technical Advisory project. The project explored the feasibility of developing a format for a bi-directional informational exchange between Tribes, local jurisdictions, and the utilities to facilitate long-term resiliency planning.

Coordination with DOE/LBNL: Through a DOE Technical Assistance grant, LBNL is supporting the exploration of how to integrate local government and Tribal resilience planning (as represented in Local Hazard Mitigation Plans, Climate Adaptation Plan, or other similar plans) into grid planning. Workshop presentations focused on planning examples at the local government and Tribal level that could benefit by interfacing with data from the Microgrid data portal (ordered in Track 1 of R.19-09-009). Funding for this project came from a DOE Technical Advisory grant.

Key Takeaways/Lessons Learned:

- LBNL found that decision-making at the bulk grid planning level could better reflect consideration of local energy equity issues and collaboratively integrate local community emergency, hazard mitigation and resilience planning reducing potential investment redundancies or gaps, increasing cost effectiveness of investments and better informing resilience/reliability project planning prioritization and siting.
- This information could be integrated into the IRP process for LSEs to consider when creating portfolios that can balance and meet resilience goals at both the local and grid level.
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Bi-directional information exchange could similarly improve decision-making and planning capabilities at the local level by allowing for collaborative prioritization of local climate change mitigation and resiliency projects.