

Resilience Working Group (RWG) Meeting Notes

December 16, 2019

8:30 am - 12:30 pm

ASB Tower

Attendees

Name	Organization	In Person	WebEx
Judy Kern	Hawai'i State Department of Health	X	
Megan Cagayan	Hawai'i State Department of Health	X	
Carilyn Shon	Hawai'i State Department of Business, Economic Development and Tourism, Energy Office	X	
Mark Want	Hawai'i State Department of Business, Economic Development and Tourism, Energy Office	X	
Alexander de Roode	County of Maui, Energy Commissioner		X
Gina Yi	Hawai'i Public Utilities Commission	X	
Dean Nishina	Hawai'i Public Utilities Commission	X	
Marcey Chang	Hawai'i Public Utilities Commission		X
Jay-Paul Lenker	Hawai'i Public Utilities Commission	X	
Casey Ann Hiraiwa	United States Army	X	
Sonny Rasay	United States Marine Corps	X	
John Bravender	United States Department of Commerce, National Oceanic and Atmospheric Administration	X	
Leigh Anne Eaton	United States Department of Commerce, National Oceanic and Atmospheric Administration	X	
Ray Tanabe	United States Department of Commerce, National Oceanic and Atmospheric Administration	X	
Crystal Van Beelen	City and County of Honolulu Emergency Management	X	
Jennifer Walter	City and County of Honolulu Emergency Management	X	
Peter Yuen	United States Navy	X	
Marc Jenson	United States Navy	X	
Stanley Garcia	Hawai'i National Guard	X	
Aaron Lau	Hawai'i National Guard	X	
Jonathan Choi	Par Hawai'i	X	
Francis Alueta	Hawaiian Telcom	X	

Name	Organization	In Person	WebEx
Corey Shaffer	Verizon Wireless	X	

Hawaiian Electric Companies Attendees

Karina Abenoja	Edine Clemente	Earlynne Maile
Ken Aramaki	Kaanoi Clemente	Todd Mayeshiro
Collin Au	Brandi Crabbe	Mat McNeff
Riley Ceria	Lisa Dangelmaier	Rick Pinkerton
Colton Ching	Christopher Lau	Troy Uyehara
Stewart Chong	Henry Lee	Lena Young

Meeting Facilitators

Gerry Cauley	Linda Colburn	Nicole Brodie
Gary Vicinus		

INTRODUCTION

Opening Remarks (Colton Ching) (8:40AM)

Purpose

- Review and comment on draft outline of RWG report
- Review and comment on RWG inputs to IGP

Lessons Learned

- Separating IGP inputs vs other recommendations
- Understanding how RWG inputs fit in overall IGP process
- Value of resilience data – Jupiter Intelligence demo

Process Overview

- Raise awareness
- Define resilience
- Define priorities
- Identify potential impacts
- Identify/assess options
- Put it all together

Topics Covered

- RWG process overview

- Prioritized threat scenarios
- Customer priorities, capabilities, and mitigation options
- Grid capabilities and mitigation options
- IGP inputs: objectives, options, resilience metrics

OVERVIEW AND PLAN FOR THE DAY

Resiliency Working Group Overview (Stewart Chong)

Meeting Objectives

- Review and comment on draft RWG report
 - Definition of resilience
 - Resilience threats and impacts to grid and customers
 - Key customer/sector capabilities and needs
- Review and comment on Integrated Grid Planning inputs
 - Resilience objectives and measures
 - Assumptions and threat scenarios
 - Resilience strategies and options – grid and non-grid

Agenda

- Review of sections 1 to 6

Meeting Handouts

- Agenda/Chatham House Rules
- Copies of the report
- Schedule of meetings
- Evaluation form

REPORT REVIEW PROCESS

General comments

- Introduction
- Threat scenarios
- Executive summary

Comments and recommendations

- Customer resilience
- Grid Resilience
- Integrated grid planning inputs

Questions to consider as we go through each question

- What does the recommendation mean to you?
- Does recommendation help improve resilience?

- Is it a priority?
- How can recommendation be improved?

SECTION 2: INTRODUCTION

Resilience Working Group overview

- Goals and objectives
- Organization and participants
- Meetings and exercises
- Report development

Resilience framework

- Definition of resilience
- Framework for assessing resilience needs

SECTION 3: PRIORITIZING THREATS TO GRID RESILIENCE

Prioritizing Threats to Grid Resilience

Historical Perspective on Severe Events Affecting Hawaiian Infrastructure

Prioritization of Threats to the Power Grid

Threat Cases for Grid Resilience Planning

- Hurricane/Wind/Flood Scenarios
- Earthquake/Tsunami Cases
- Wildfire Scenarios
- Physical and Cyber Security Scenarios
- Volcano Scenarios

Threat	Includes	Oahu	Hawai'i	Maui County
Hurricane	Flood, Wind	X	X	X
Tsunami	Earthquake	X	X	X
Wild Fire		X		X
Physical Attack	Cyber Attack	X	X	X
Volcano			X	

Jupiter Intelligence

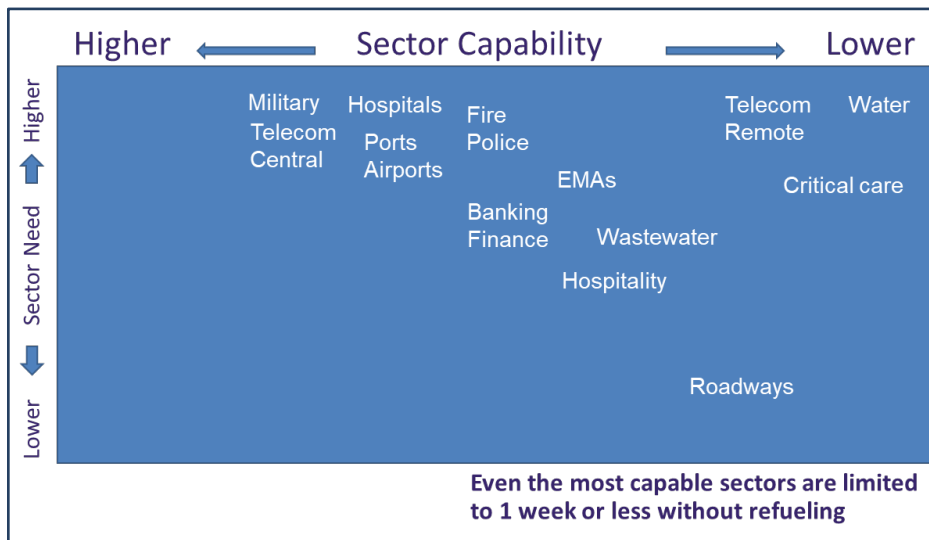
Flood & Wind perils to be examined as part of IGP assessment

- Sea level rise has been moderate in Hawaii, but the rate is expected to intensify through the rest of the century.
- Wind model still being developed (Feb 2020 expected release date)

SECTION 4: CAPABILITIES OF KEY CUSTOMERS AND INFRASTRUCTURE SECTORS

Capabilities of Key Customers and Infrastructures

- Prioritizing Customers and Infrastructure Sectors
- Key Customer Capabilities and Needs
- Opportunities for Critical Customers to Improve Resilience from Loss of Power Events



Comments from the Group:

It does not make sense to group “military” together on the chart since the Army has its own Schofield power plant, whereas Navy and Marines are completely dependent on Hawaiian Electric.

- Consider placing an asterisk next to the word Military in the chart to point to more detailed language within the report to describe the differences.
- The other energy sectors (such as energy for transportation) are not included in this chart, but we’ve discussed the importance of other fuel sources and resupply to stand us back up.

Recommendations for Customers and Infrastructure Providers will appear in black under the recommendation.

Slide 20

1. Infrastructure providers should work together in a close partnership to coordinate disaster recovery. Recovery and risk mitigation are shared responsibilities between the power companies and key customers

- What's the framework for that partnership? Emergency Management planning? Pre-planning mitigation, long-term hazard mitigation.
 - Expand on that. From policy, to planning, to prioritizing, resourcing and assembling. What does this look like from end to end.
 - Where does Homeland Security fit in this, particularly around Cyber security threats? What is the holistic approach and framework? Are there separate planning and policy efforts? How can we bring them together. Who coordinates between the agencies?
 - The coordination and the planning currently comes through HIEMA. Going forward it's going to take a more robust effort than what is currently going on right now. That effort under DHS right now includes cargo and liquid fuels.
- Importance of coming together to have a dialogue. This recommendation does not mean that we have to create a NEW method or group. Rather, this notion here is that through existing mechanisms, if they are already effective, we need to make sure that we have a discussion on the interdependencies of the different infrastructure sectors. To ensure that we can hit the ground running if something happens.
- Most customers already know what their critical loads are. From HECO's standpoint, it may be important to bluntly tell people: "Expect the grid to be down 3 to 5 days minimum. What are your critical infrastructure points that will be affected?"

2. Customers should provide load management/load curtailment capabilities to limit power usage to mission critical loads during emergencies with loss of offsite power

- "Customers should provide... capabilities..." What does this mean? What are interim steps that ask people to be cognizant of their own usage?
- Focus on what customers can do to prepare, avoid, reduce.
- How are we going to capture how that changes over time?
- Suggested language: "Customers should provide load management and curtailment." or "If customers can reduce their consumption and variability, we are asking that they do."

3. The most critical capability for most key customers and infrastructure sectors is having backup power capabilities and the ability to acquire fuel resupply if outages are extended beyond a few days into weeks; customers should provide backup power generators that can supply essential loads during emergencies

- Has a refueling study been done for this island?
- That need to update their own facilities if they have sufficient backup generation. They should also provide information on different fuels or backup generators.
- FEMA has been working with the state to determine what the fuel requirements are. We have been asked to bring in fuel at great quantities. The logistics of which are still being developed. In order for us to be successful and provide reliability for fuel resupply, we need to know everyone's prioritized fuel requirements. They are working with Hawaiian Electric to figure out which customers are the priority. There is a lot of planning going on around fuel currently. The available information is incomplete. The approach that has been taken in the past has been focused on small events and people report them in RFAs. Overall, the lack of a state level fuel strategy is identified as a gap. ESF 12 doesn't have the capacity to run a whole statewide fuel delivery strategy. DoE is working alongside Emergency Management State.
- Trying to understand critical customers and their needs.
- We're looking at developing a fuel management plan to figure out if our current infrastructure were disrupted, what could we stand up instead.

Slide 21

4. Customers should provide onsite fuel for extended power outages during severe events and have in place plans and capabilities to resupply fuel for outages exceeding expectations; coordinate fuel plans so that multiple facilities and sectors are not relying on the same fuel resources at the same time

- We cannot diversify our fuel supplies. We are all getting our fuel from the same place. Adds weight to why this discussion needs to happen before an emergency. Only one refiner. When we think about diversity, it's about distribution. Everything is dependent on getting the rack facility working and the trucks moving. Considering that that is all one place, it's important to look at getting diversity for the racking facilities and trucking.

5. Customers should test and exercise backup power resources

- Customers need to know that it's not enough to run them to check that they're working. They have to be tested under load.

- Have contracts in place to support backup resources or any assistance that may be needed. What kind of technical assistance is needed to maintain those backup power resources?
 - What backup resources do customers have and where are they located? Protect generators from inundation to ensure they aren't lost in a severe event.
- Understanding the need for relocating essential functions as continuity planning.
- 6. Customers should consider relocating critical facilities or building new facilities at sites/locations with more robust infrastructure support**
 - Clarify what "robust infrastructure" means. List criteria.
 - 7. Customers should consider transportable generators that can be relocated to critical sites during emergencies**
 - Clarify "critical sites" and that 5 blocks seems close by until the roads are down.

Slide 22 - (Recording started at 10:11am)

- 8. Customers (transportation sector) should ensure adequate road clearing equipment for repair storm damage on key roads, ports and airports**
 - HIEMA would coordinate the road clearing stakeholders from city, state, and HECO.
- 9. Customers (transportation sector) should reinforce harbors and port facilities against flooding and storm damage to ensure they can deliver fuel and critical supplies during extended power outages following severe events**
- 10. Customers (transportation sector) should consider provision of alternative backup port facilities and/or delivery options during emergencies**
 - MOU signed between Coast Guard. One crane in place.

Slide 23

- 11. Customers should consider partnering with Utilities to develop local microgrids for power that can be isolated from the grid when needed (during severe events); consider alternative technologies, such as renewables and storage, and other clean fuel blackstart resources**
 - Are there new technologies that allow for being grid-tied in some cases and then not grid-tied in others?
 - i. Inverter systems need a signal from the grid in order to operate. Grid farming, voltage source inverters. They don't rely on the grid to run. They can run themselves or other inverter-based systems they're tied to. Much less common for industrial commercial uses. There are no standards for that. Part of Stage 2 RFP is requesting for this functionality.

12. Customers should provide training and exercises that address performing emergency operations with loss of offsite power

SECTION 5: OPPORTUNITIES TO IMPROVE GRID RESILIENCE

Opportunities to Improve Grid Resilience

- Characteristics of Power Grid on Each Island
- Additional Options for Improving Grid Resilience

Recommendations for Utilities Actions – Non IGP

Slide 26

1. Utilities continue to explore and develop advanced resilience data as demonstrated by the technologies of Jupiter Intelligence
2. Utilities partner with key customers to develop microgrids for power that can be isolated from the grid when needed (severe events)
 - We have a microgrid tariff document. Includes things beyond IGP.
3. Utilities reinforce fuel resupply options by increasing storage and delivery capability for severe event emergencies
 - Hawaiian Electric companies have a separate contract with the refiners. As a SOP for HECO on Oahu, they carry 45 days of (normal conditions) inventory on hand. It's a little less on Neighbor Islands. There's an opportunity for improvement. Getting access to this fuel supply depends on the distribution infrastructure to get it from storage to the plants where it's needed.
 - Consider partnering with Emergency Management stakeholders for coordination of fuel supply. If the utility has a large supply on hand, then Emergency Management might be able to help distribute the supply.
 - Could the State DOD stockpile fuel that could be used within other parts of the community.
 - The burn rate would be much lower than normal operations.

Slide 27

4. Utilities expand critical resources, supplies, backup equipment, and materials to restore damaged circuits, substations or generators, including distribution more quickly following severe events
 - The estimate is that we have 10 to 12 days base supply on-island. Though, in reality it's probably a lot less than that. In parallel to this effort, they are conducting an internal assessment.
 - It's dependent on the materials. While the utility has enough volume of certain things like poles and insulators, the substation transformers take 12 to 14

months to be manufactured somewhere and then shipped to Hawaii. 2 types of risks with supplies: do we have enough of the common materials and how long it takes to get the custom materials made and shipped here.

- We are also looking at other opportunities and locations for expanded pole yards.
 - Looking at Big Island for storing stuff. Understanding that harbors are going to have problems. Storing materials in multiple locations so as not to have all eggs in one basket. Though, the vulnerabilities of roads makes HECO less comfortable with dispersed storage of critical resources.
5. Utilities plan for emergency access for additional helicopters on islands to support repairs in remote, difficult to access sites
- Asking for helicopter pilots. Hurricane season is at the same as fire season in California, so that resource is being used in two places at once.
6. Utilities plan for additional crews during emergencies and provide training for emergency situations
- “Specialized personnel resources” (including helicopter pilots)
 - The utility is planning a company drill. Folks in this group can sit in on the drill if they’re interested. They will practice moving materials. The purpose is to establish estimated times for restorations.
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- What is the state DOD and the Federal DOD’s role in Hawaii? Fed DOD is one of the largest customers. Their systems are very integrated into each other. Giving us access to a portion of the base. Working on easements. Microgrid for the Navy to enhance resiliency from a major event. Develop something that works for the Navy and for the HECO customers.

Slide 28

7. Utilities plan for enhanced vegetation management, particularly in critical grid areas susceptible to damage from wind and falling or flying debris
8. Utilities continue hardening or reinforcing critical transmission circuits, including upgrading wind criteria and flood mitigation, upgrading structures, and using enhanced construction methods and materials
- Include this bullet and the next bullet in IGP.
9. Utilities continue expanding underground cables (water resistant) and locating equipment outside flood prone areas
- Consider investment options in a way that looks at a cost-benefit analysis.

Slide 29

10. Utilities consider alternative paths for transmission circuits to increase diversity of location and enhance performance during severe events
11. Utilities continue to require that new RFPs for renewables bids include grid-forming inverters, meaning they can provide a blackstart capability
 - A danger of this infrastructure is if people start feeding power into a system that was thought to be shut down while people are working on it. Having two-ways systems introduces risks that need to be considered and mitigated.
12. Utilities establish one or more priority circuits with enhanced restoration capabilities and greater hardening
 - Look at coordinating with the energy sector and identifying potential priority circuits, routes, or supply chains.

Slide 30

13. Utilities consider adopting advanced technologies in a more distributed resource approach, including grid-forming renewable energy sources, alternative clean fuel blackstart resources, battery storage, and joint projects with key customers to provide microgrid capabilities for emergency operations
 - “alternative / clean fuel”
14. Utilities develop wildfire mitigation strategies for worst case wildfire event at Maalaea
15. Utilities develop and test capabilities with expanded use of drones for emergency response and regular maintenance inspections

Slide 31

16. Utilities evaluate options for distribution automation, digital meters and associated communications networks can be valuable in assessing system conditions, the extent of outages and how to best prioritize recovery efforts to get customers reenergized more quickly
17. Utilities consider actions to reduce tsunami risk impacting generation in the inundation zone in southwest O’ahu
 - Look at whatever comes out of Jupiter modeling. Sea level rise could affect future tsunami inundation zones.

18. Utilities review customer restoration priorities to consider the critical infrastructure tiers identified by the RWG
 - Seek input from Emergency management and other stakeholders.

SECTION 6: INPUTS TO INTEGRATED PLAN

Inputs to Integrated Grid Plan

- Resilience Related Objectives
- Potential Solutions and Strategies
- Alternative Scenarios
- Harmonization of Resilience with Other Objectives
- Balanced Scorecard of Objectives
- Potential Actions outside of the IGP
- How RWG Input Can Best Be Used

Recommendations for Integrated Grid Planning

Slide 34

1. **The following threat scenarios be used by the Utilities to guide the IGP process and other resilience initiatives, and also by key customers and critical infrastructure partners in developing resilience preparations**
 - a. **Hurricane/flood/wind**
 - b. **Tsunami/earthquake**
 - c. **Wildfire**
 - d. **Physical and cyberattack**
 - e. **Volcano**
2. **Utilities consider the key customer and infrastructure priorities identified by the RWG when planning system expansion or improvements**
 - Try to integrate priorities as much as possible as laid out by Emergency Management plans.

Slide 35

3. **Utilities develop IGP objectives that include optimizing resilience and cost of resilience; and merge resilience with other planning goals of the Utilities such as reliability, renewable energy expansion, sustainability, carbon emissions reduction, environmental stewardship, rate stability, etc.**
4. **Utilities consider in these objectives:**
 - a) **Reduce outage risk during severe event;**
 - b) **Reduce outage magnitude during a severe event;**
 - c) **Reduce restoration and recovery time following a severe event;**
 - d) **Optimize cost (including capital and operating costs, and probability weighted outage and recovery costs, etc.);**
 - e) **Return critical and priority customers power within specified time;**
 - f) **Return power to other customers within specified time; and**
 - g) **Limit environmental impacts.**
 - 4a: Consider risks to a critical customer versus a residential customer. There will be an outage, but what are the differences in risks?
 - Looking at the economic side of resiliency. How do we include the cost impacts of major outages and mitigation plans. Consider the economic costs of a prolonged outage.
 - 4a: First bullet is meant to be inclusive of all objectives across the spectrum. resiliency is one among many. The second one 4b is what are the components of resiliency.
 - 4e: “Return critical and priority customers power...” seems overly broad. Critical functions of that customer. Minimizing load--not make a metric of just getting it to that customer, but ensuring that there is enough to power the critical functions and ONLY critical functions.

Slide 36

5. **That the Utilities consider all possible lowest cost solutions, whether they can best be accomplished solely through utility actions or through a combination of utility and stakeholder actions; hence RWG recommends that some consideration of stakeholder actions be captured in the analysis of options.**

- 6. That all relevant costs should be captured, which includes the costs that Utilities might incur to mitigate severe outages, as well as the cost of the outage to customers and stakeholders; it might also include costs that customers incur to mitigate the impact of severe outages, especially if those measures might be more cost effective than those incurred by the utility**

Ideally, everyone implements as a result of this plan. We don't want to identify recommendations and action steps and find that utility and customers fall short in enacting these recommendations. It doesn't really matter whose fault it is at that point. From an implementation standpoint, we have to see how implementable these pieces are, to make sure that the plan is as successful as possible. Will we get the outcome and results we're looking for? We want to be careful how dependent we are on other customers' efforts in doing their part to build resiliency.

What group is best suited to figure out implementation of these recommendations?

Slide 37

- 7. That the Utilities should evaluate multiple objectives and determine a portfolio of options that best meets all objectives at a reasonable cost**
 - (Restated from a previous slide)
- 8. That Utilities should develop measures of resilience for Integrated Grid Planning to allow evaluation of resilience performance of various options under assumed scenarios and conditions**
 - There might be an opportunity to use the same metric for resiliency within this group as the PUC is using in their Performance-Based Regulations.
 - Will this metric only be applicable if something happens?
 - i. No, there are ways to model and simulate scenarios to determine resiliency without needing an event.
 - How resilient are we for something that takes us out for a day? That can be a good tool to model resiliency for the larger events.
- 9. That resilience should not only be measured as a cost but should be a separate goal with its own measurable outcomes. This step requires the definition of resilience goals and quantification of the degree of resilience achieved in a single metric.**

Slide 38

- 10. That Utilities consider options for more decentralized or distributed energy resources closer to load areas**
- 11. That Utilities consider options for expanding customer-based programs and other non-wires solutions for improving reliability and resilience**
- 12. That Utilities assess options for enhancing resilience through the mix and location of generation resources, including expanding renewable resources with grid-forming capabilities**

Slide 39

- 13. That Utilities consider configuring the grid in several mini grids that could operate as independent islands that could be self-supplying over an extended period of time during severe emergencies**
- 14. That Utilities consider plans for best locations to expand and diversify blackstart resources and delivery paths to support grid restoration and timely recovery of key customers and critical infrastructure sectors**
- 15. That Utilities consider targeted transmission/sub-transmission additions to enhance redundancy and diversity of delivery paths and reduce risk from severe events**

What's happening in Puerto Rico best aligns with what we're doing on the Big Island--longer more vulnerable ties. Can we operate without the ties?

Schofield is very small in relation to the load.

SECTION 1: EXECUTIVE SUMMARY

- RWG objectives and process
- Assessment of grid resilience needs
- Resilience considerations for IGP and other activities
 - Objectives
 - Inputs to process
 - Strategies for consideration
 - IGP recommendations
- Organization and uses of the report

NEXT STEPS

Accepting comments until January 10th. We will evaluate the comments that we receive.

There's a chance we may reconvene the group or work via email or privately to process and integrate that comment.

CLOSING REMARKS

- For those people who have questions as they read through the report, please feel free to email or call Stewart to make sure that things make sense.
- This is the first time we are taking on resiliency. Don't limit your comments and thinking- think more broadly about resiliency.
- We may reconvene this group after January 10th. We have found that this group has been helpful in guiding our thinking more generally around resiliency.
- We are thinking of bringing this group together, in at least, an optional capacity to gain more insight.
- Thank you for taking the time to participate and provide your input.

Next Meeting