EEPS TECHNICAL WORKING GROUP (TWG) MEETING

SEPTEMBER 29TH, 2020

via Zoom web conference

TED POPE

ENERGY EFFICIENCY MANAGER TEAM

WELCOME
MEETING OBJECTIVES
EEPS REVIEW UPDATE

AGENDA

- 1:00 – Welcome
- 1:05 – Meeting Objectives, EEPS Updates
- 1:10 – Market Potential Study: DERs and Interventions
- 1:30 – EEPS Review EM&V Wrap-up
- 1:50 – EEM Perspectives from EEPS Review
- 2:20 – Q&A
- 2:30 – Adjourn

EEPS REVIEW REQUIREMENTS AND TIMING

- The EEPS Framework defines four Performance Periods during the EEPS implementation timeline of January 1, 2009 through December 31, 2030
- It requires five Evaluation Reports during this time, due 20 days before the convening of the legislative session

EEPS Performance Periods (calendar years)	Evaluation Reports	Submit Date
2009-2015	First Report	January 2014
	Second Report	January 2019
2016-2020	Third Report	January 2024
2021-2025	Fourth Report	January 2029
2026-2030	Fifth Report	January 2034

EEPS EM&V FOR THE 2009-2015 REVIEW – THE PLAN IN 2017

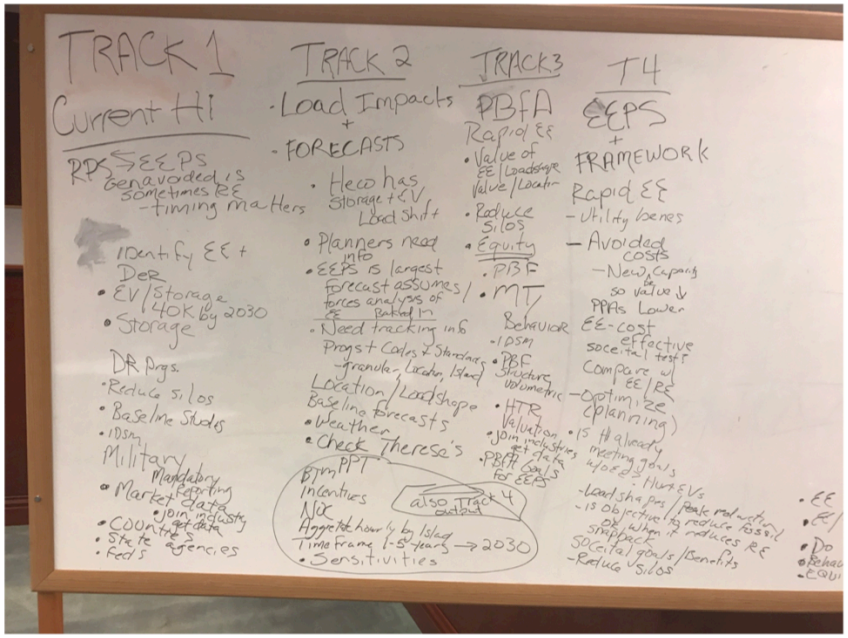
- EEPS Load Impact Evaluation (GWh) 2009-2015
  - Develop analysis for the "Report to the 2019 Legislature on Hawaii's Energy Efficiency Portfolio Standards"
- Baseline studies – current electricity use in Hawaii
  - Detailed surveys of buildings, equipment, and customer demographics (onsite, mail, phone and web)
- Energy efficiency potential study and scenario analyses
  - Available cost-effective EE potential based on updated baseline information, avoided costs, rates, technologies, etc.
  - Use or develop estimates of likely DER penetration in order to identify opportunities, costs and benefits of efficiency
- Roles: Commission, **TWG,** EEM, and EM&V Consultant

EEPS Technical Working Group Meeting

September 27, 2017

1132 Bishop Street, Honolulu

FALL 2017 TWG "HOPES & DREAMS" FOR EEPS REVIEW



- TWG "white-boarding" session in September 2017
- At February 2018 TWG, EEM presented the synthesized list of "hopes and dreams"
- The summary list informed the EEPS Review research questions, though not all topics could be addressed

INGRID ROHMUND
APPLIED ENERGY GROUP

MARKET POTENTIAL STUDY

KELLY MARRIN
APPLIED ENERGY GROUP

EEPS REVIEW EM&V WRAP UP

MPS Update & EEPS Review Period Wrap-Up

September 29, 2020

Prepared for Hawaii Public Utilities Commission

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AGENDA

Market Potential Study (MPS) Update

- Quick overview
- Distributed energy resources (DERs) and rates
- Program concepts

Energy Efficiency Portfolio Standard (EEPS) Retrospective

- Highlights of the analysis
- Key research questions
- Findings and implications

AEG
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MPS – DERs and Interventions

Energy Efficiency Portfolio Standards

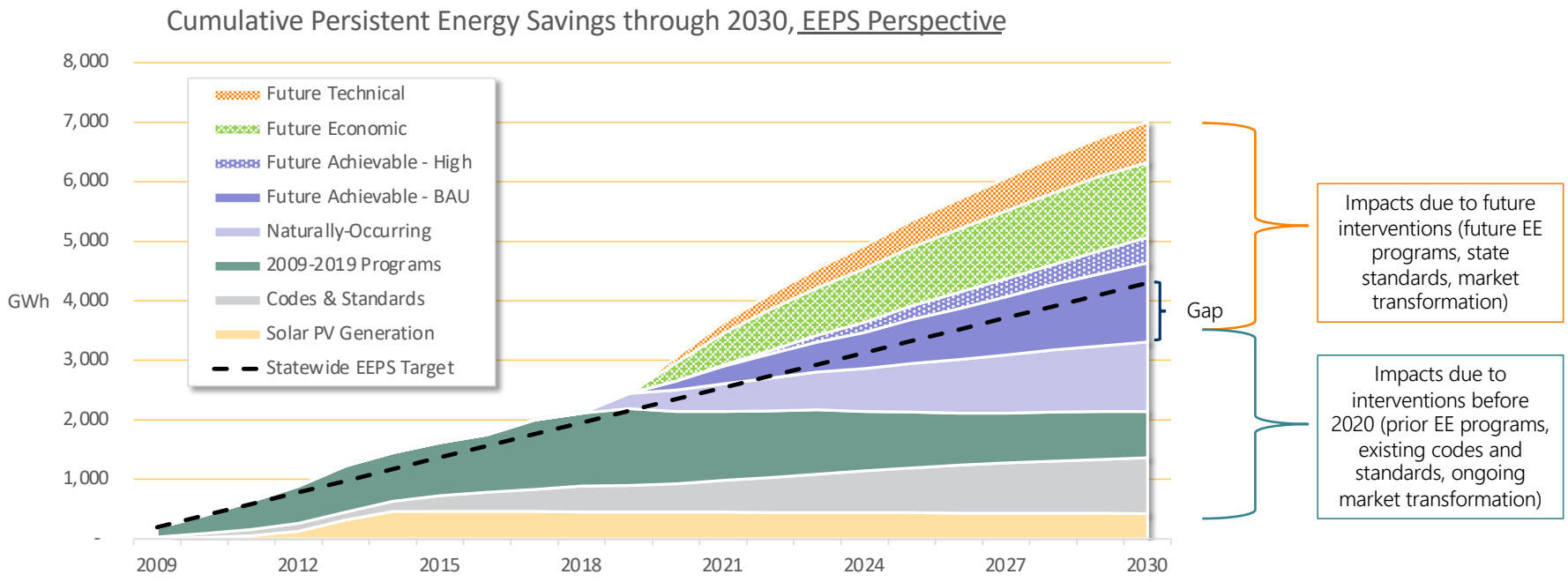
EEPS Progress to Date and Future Projections

The EEPS target appears to be attainable under the Achievable business-as-usual (BAU) scenario, in which programs continue in a similar manner

- The gap is ~1,000 GWh in 2030

There is substantial amount of additional cost-effective savings – economic potential (in green) – available through 2030

Interventions can come from many sources – some of which have already occurred due to previous efforts in Hawaii



ACHIEVABLE POTENTIAL EE SAVINGS BY END USE

SUMMARY OF RESIDENTIAL AND COMMERCIAL SECTORS

The commercial sector is expected to contribute more savings than residential

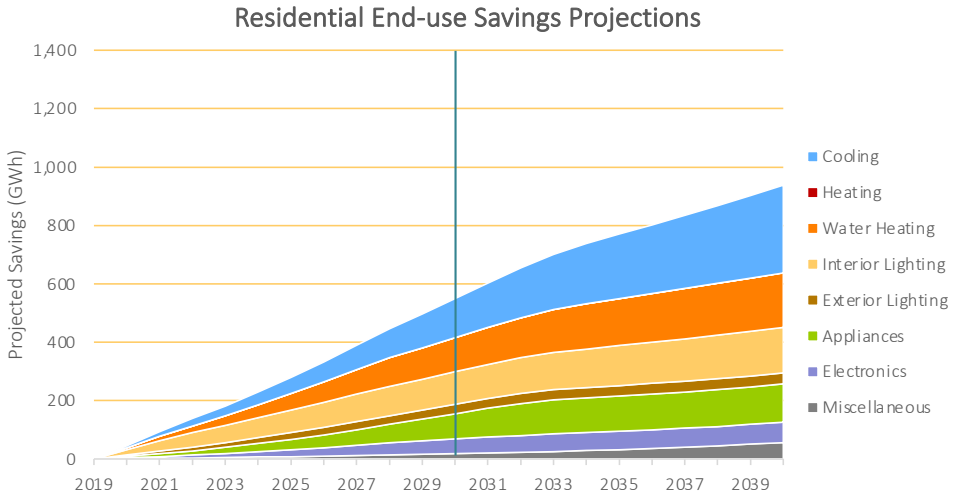
By 2030, the residential sector is expected to achieve between 549 GWh and 770 GWh

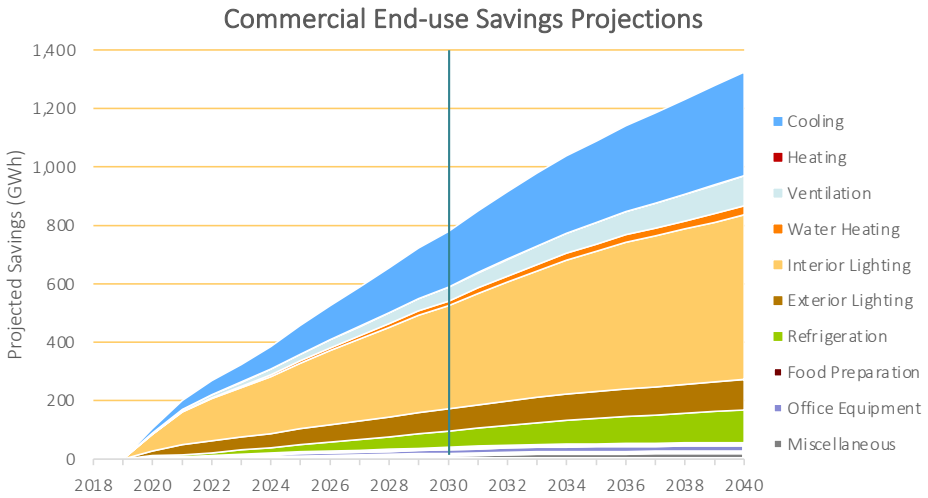
- Cooling, water heating, and lighting measures account for the majority of savings

By 2030, the commercial sector is expected to achieve between 780 GWh and 986 GWh

- Substantial savings come from lighting measures followed by cooling

There are also substantial BAU achievable savings available beyond 2030





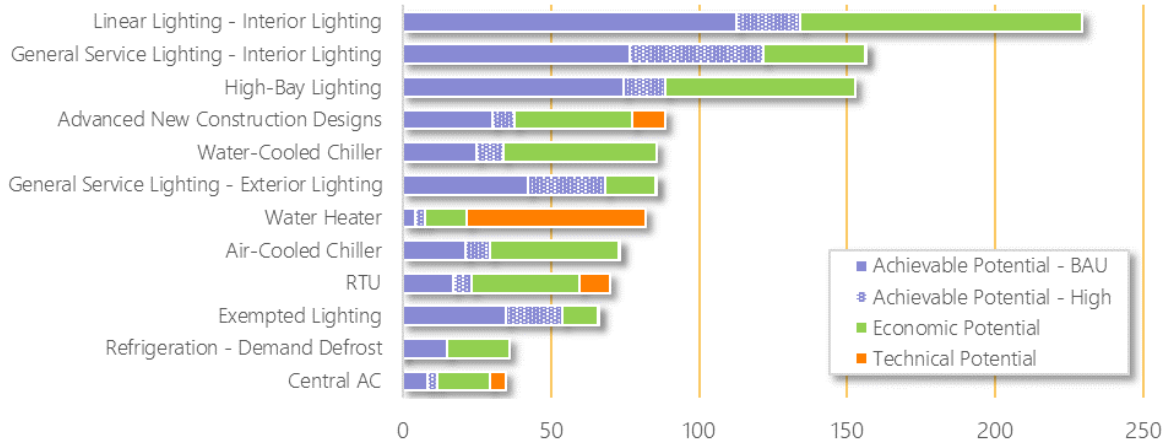
Additional Cost-effective EE Potential

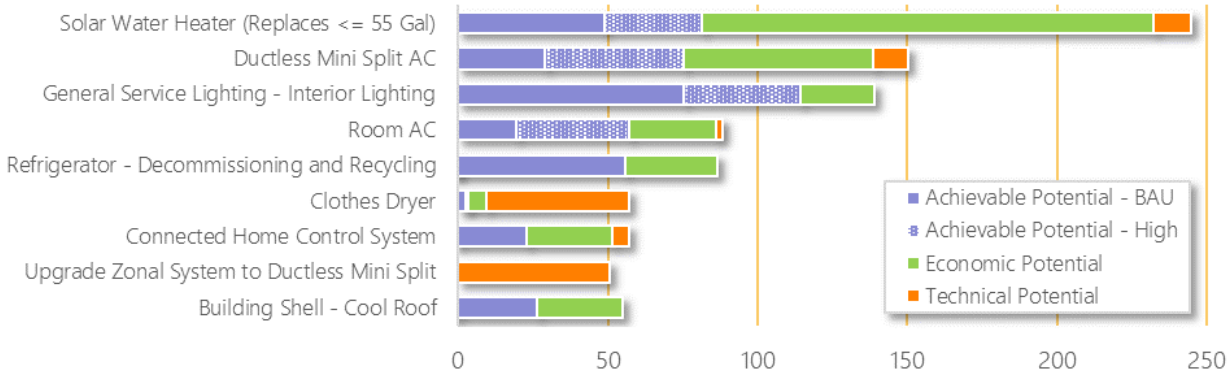
Savings in Addition to Achievable High Case

Green-shaded segments indicate additional cost-effective savings available if 100% customer adoption were accomplished

Identifies opportunities for increased PBFA activity and/or other interventions, such as state-level standards

Orange area is additional potential that is not estimated to be cost effective with study assumptions (measure savings, measure cost and avoided cost)

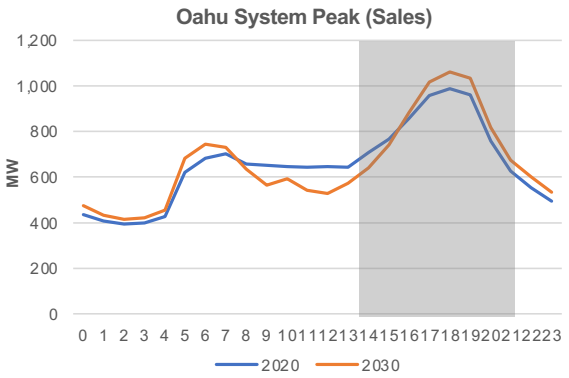


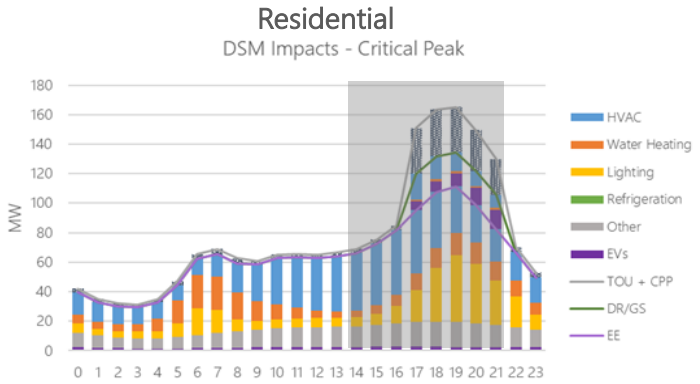


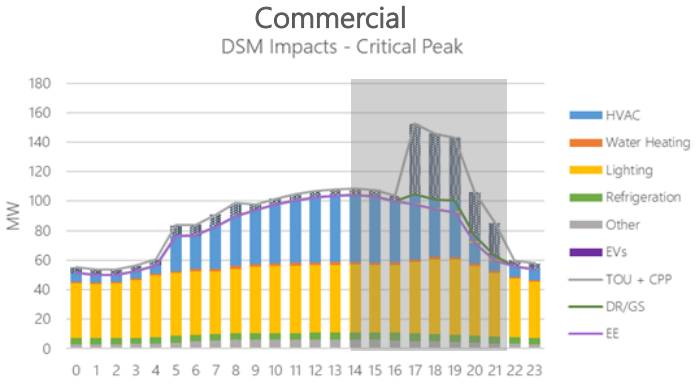
How do EE, DERs and Rates Interact to Reduce Peaks?

Backdrop:

- Peak period is during evening hours as a result of large amount of solar PV
- Sales during peak hours are expected to increase over next 10 years







Hourly impacts:

EE (under the purple line)

- Shows substantial potential for overall reduction on peak days

DR/GS (btw. purple and green lines)

- shows high potential during the peak period for residential

Rates (btw. green and grey lines)

- Show the highest ability to target peak periods
- Impacts used may not be reflective of Hawaii response to programs

Demand Response / Grid Services

Menu of Possible Events for Residential and Commercial combined on Oahu

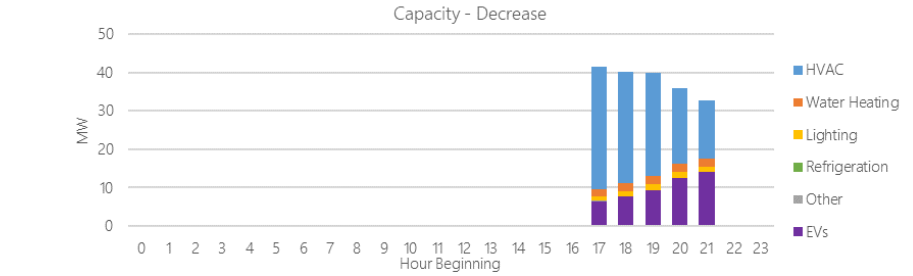
AEG modeled five different grid services

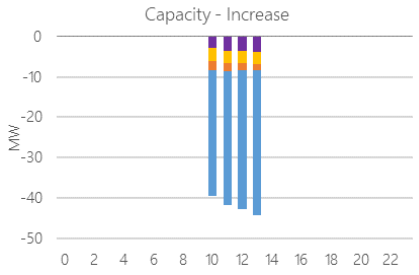
- Capacity – Decrease
- Capacity – Increase
- Non-Spin Auto Response – Decrease
- Regulation Reserves (RR) – Decrease
- Fast Frequency Response (FFR) – Decrease

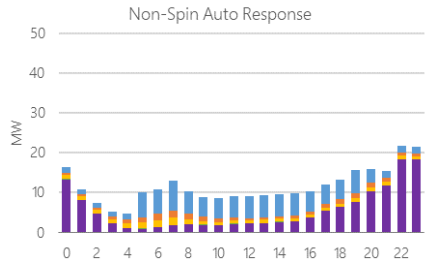
These impacts cannot be combined (or stacked)

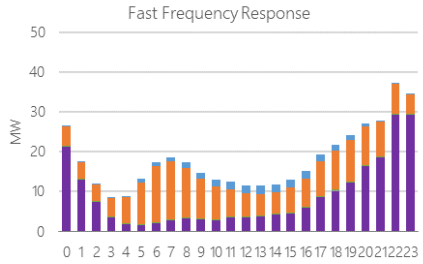
Key technologies to target include

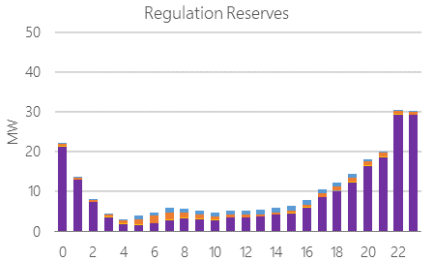
- HVAC – particularly for capacity programs
- EVs – across all programs but especially RR
- Water Heating – particularly for FFR



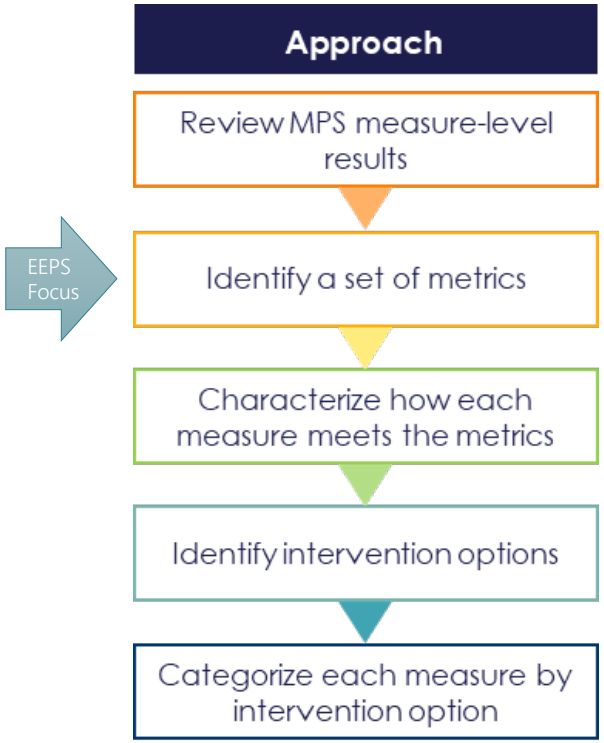








Approach for Developing Intervention Concepts



Intervention options:

- **PBFA Programs**: Measures with high potential as well as promising new measures
- **PBFA Programs or Future Code / Standard**: Measures that could be offered through PBFA programs or by establishing future state codes and standards (or helping to lobby for new Federal standards)
- **DR/GS Facilitator**: "Connected" equipment and measures that provide both energy efficiency and grid services
- **Newly-enacted Standard**: These measures fall under a new standard that takes effect in 2021, transitioning away from a PBFA program.

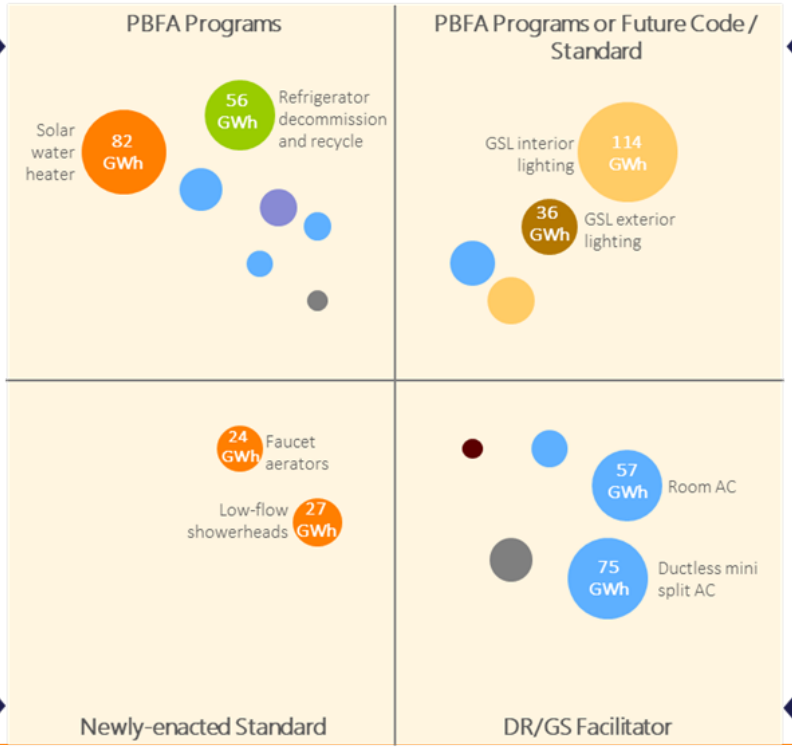
Summary of Intervention Concepts: Residential Sector

- Most high-saving measures can be promoted through PBFA Programs and Future Code/Standard
- A few AC measures are well-suited to DR/GS initiatives

Solar Water Heater (82 GWh)
Refrigerator Decommission/Recycle (56 GWh)
Room AC - Removal of Second Unit (21 GWh)
Advanced Power Strips - IR Sensing (16 GWh)
Dehumidifier (9 GWh)
HVAC - Plant Shade Trees (8 GWh)
Behavioral Programs (5 GWh)

Legend
- Interior Lighting
- Water Heating
- Cooling
- Appliances
- Exterior Lighting
- Miscellaneous
- Electronics
- Electric Vehicles

Low-Flow Showerhead (27 GWh)
Faucet Aerator (24 GWh)

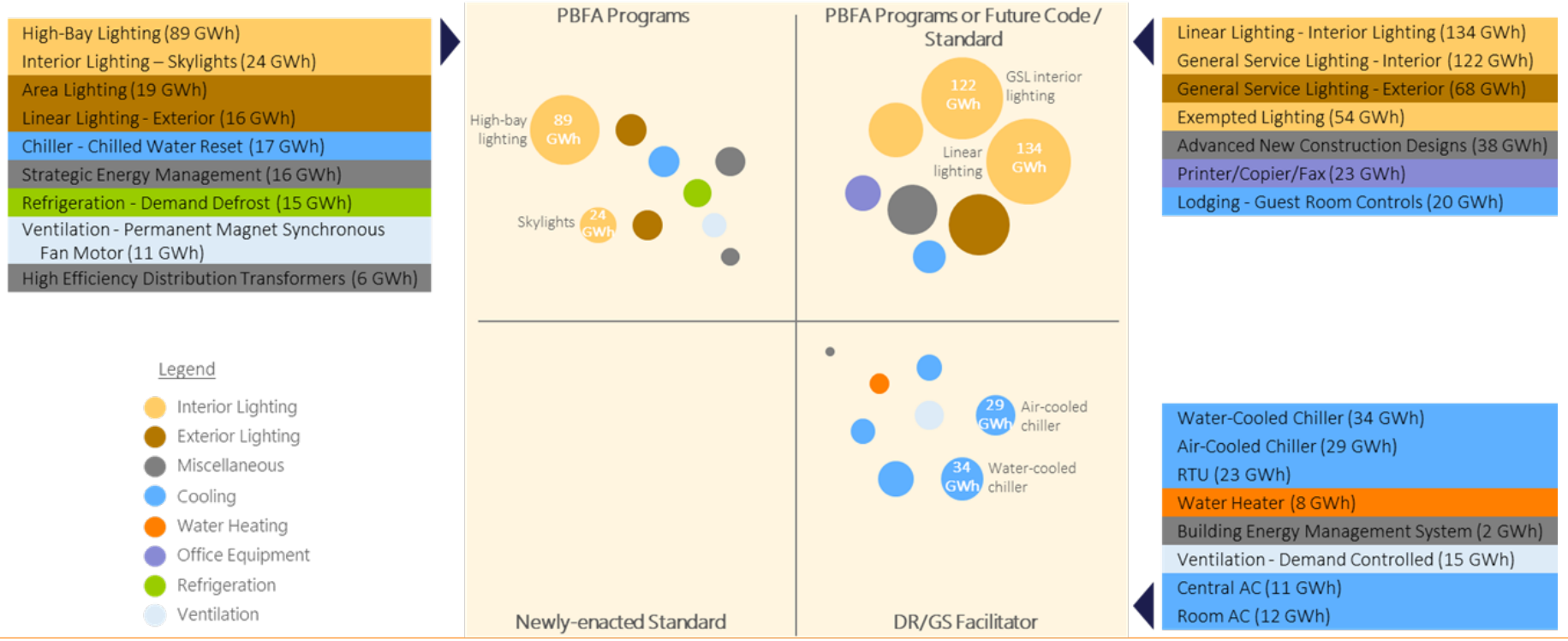


General Service Lighting - Interior (114 GWh)
General Service Lighting - Exterior (36 GWh)
Exempted Lighting (26 GWh)
Building Shell - Cool Roof (24 GWh)

Ductless Mini Split AC (75 GWh)
Room AC (57 GWh)
Connected Home Control System (21 GWh)
Central AC (15 GWh)
Electric Vehicle Charger (5 GWh)

Summary of Intervention Concepts: Commercial Sector

- Lighting is major contributor to savings and can be supported through PBFA programs and Future Codes/Standards
- Several cooling measures are well suited to DR/GS initiatives



Summary of Savings from Program Interventions

Cumulative Savings in 2030

The gap to achieve the EEPS target of 4,300 GWh in 2030 is ~1,000 GWh

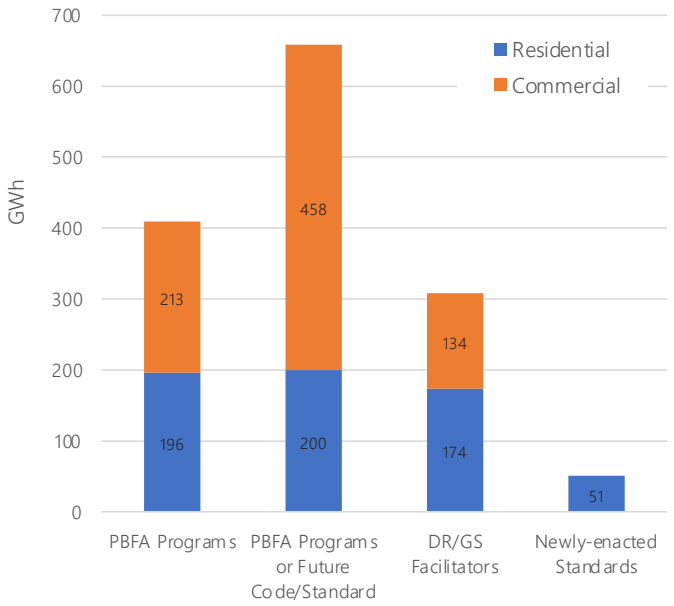
- See slide #4

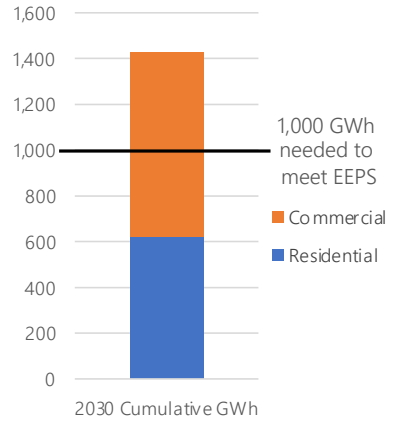
The figure on the left summarizes savings by intervention and sector

The figure on the right summarizes savings by sector

- Contributions are roughly equal between residential and commercial

Sum of savings from interventions exceed the 1,000 GWh gap by 40%



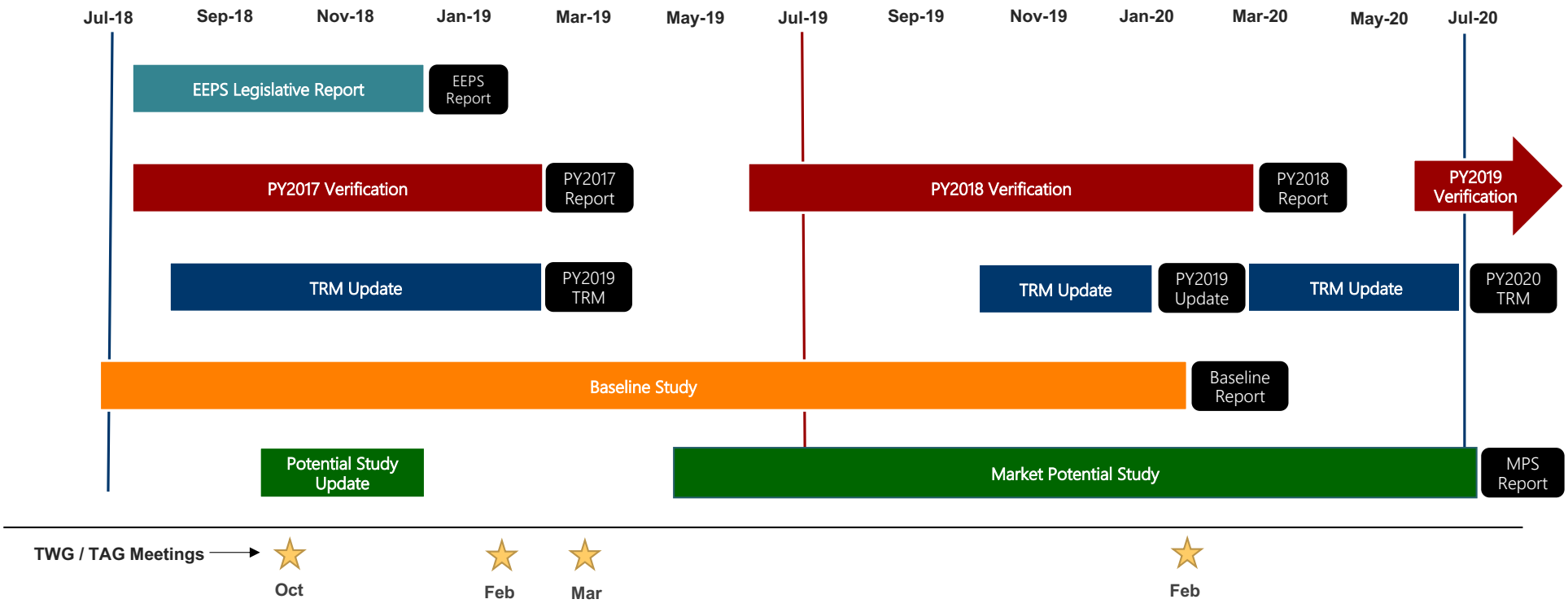


EEPS REVIEW RETROSPECTIVE

KEY INSIGHTS FROM EM&V AND EEPS RESEARCH STUDIES

- Hawai'i Energy programs have been successful, as demonstrated by annual **Verifications** (and other **EEPS Research**)
  - Hawai'i Energy obtained 99% of their savings goals and 80% of the EEPS interim goal
- EEPS Research shows savings are changing over time
  - Energy impacts have been heavily focused on prescriptive measures such as lighting, but more complex custom measures are likely to become a larger part of the portfolio.
  - The **Baseline Study** and **Market Potential Study (MPS)** show greater opportunity for savings from custom measures such as space cooling moving forward
- The **MPS** indicates that no major changes are needed to Hawai'i Energy's portfolio over the next several years, however recommendations include:
  - There is a likely benefit from measure diversification, and the appetite for integrated programs and future rate-based options should be evaluated
  - Programs will need to plan for various outcomes with respect to standards
- *It should be noted that this presentation is focused on EEPS related activities and outcomes which do not speak to demand flexibility, decarbonization, and other important new state objectives and policies.*

EEPS EM&V Activities



EM&V Research Activities a Retrospective

Goal of this exercise was to look back at the 5 Key EM&V Activities conducted over the past two years through the lens of the key research questions

- First, we look at each **activity** over time including:
  - EEPS Research (EEPS)
  - Verification of Savings (Verification)
  - TRM Updates / Framework (TRM)
  - Baseline Study (Baseline)
  - Market Potential Study (MPS)
- Then, we review the research questions in the following **areas**:
  - Past EEPS Savings
  - Energy Consumption
  - EEPS Savings Potential
  - The Future of EEPS Savings
- Finally, we use those two aspects to achieve three goals:
  - Look at how the key activities relate to each key area
  - Identify key findings in each area
  - Identify key implications in each area

RESEARCH QUESTIONS

Past EEPS Savings	Energy Consumption Characteristics	EEPS Savings Potential	Future of EEPS Savings
Is Hawaii meeting the EEPS goals?	What overarching trends affect consumption?	How might future savings be split among naturally occurring, codes & standards (C&S), DERs and EE?	Specifically, what role will lighting play?
Who are the major contributors to savings?	How are customers with DERs different?	How do EE and DERs interact?	What types of measures and interventions have the most potential?
What are the major contributors to savings?	What happens to savings at the grid edge?	How can electrification of transportation play a role?	Which grid services have the most potential to address future challenges?
Can we improve the robustness of ex post savings estimates?			Can we improve the robustness of ex ante savings estimates?

At the outset of this engagement AEG and the EEM developed a set of more than 50 Research questions to guide our work. This table summarizes the most important questions that we will use during our retrospective today.

KEY ACTIVITIES – HOW THEY RELATE

Past EEPS Savings

Key Findings and Implications

	Findings
EEPS Research	• State of Hawaii is on track to meet the 2020 interim EEPS goal
	• Program portfolio relies heavily on lighting
	• Hawai'i Energy programs are cost effective

TRM	• TRM updates resulted in
	  ◦ More accurate savings estimates
	  ◦ Modifications and improvements to implementation
	• TRM Framework supports continuing improvement

MPS (round 1)	• Current efforts and market trends will shift lighting savings shifting into the baseline and out of programs

Implications

- Hawai'i Energy programs are major contributors to the EEPS goals, given a similar savings trajectory
- A more accurate TRM results in more accurate savings estimates
- More diverse programs (by end-use) are likely needed to achieve 2030 cumulative savings goals

Energy Consumption Characteristics

Key Findings and Implications

	Findings	Implications
Baseline Study	• The lighting market is not completely transformed • Residential EV saturations are rising • Residential net energy metering (NEM) Customers consume, in total, more electricity than non-NEM customers • Savings from EE measures installed at locations with solar PV **are** realized on the grid	• There are near term opportunities for additional lighting measures • Residential EVs represent a growing end-use load that can provide grid services • There are growing opportunities for EE measures in residential and commercial cooling

EEPS Savings Potential

Key Findings and Implications

	Findings	Implications
2020 MPS Study	• EEPS goals are achievable under the Business as Usual scenario • EE Potential is highly concentrated in cooling, lighting, and water heating across both sectors • HVAC, EVs and water heating show substantial potential for grid services in both sectors • Critical Peak Pricing rates show significant savings potential	• There are technology options, outside of batteries, that are good targets for grid service programs • Some end uses, i.e. water heating and cooling, have substantial EE and grid service potential and would be good targets for integrated programs • Variable or dynamic rates should be tested in Hawaii to confirm their savings potential

The Future of EEPS Savings

Key Findings and Implications

	Findings	Implications

2020 MPS Study	• Lighting, HVAC, water heat, and custom programs still have the highest savings and value
	• Lighting will be a key component of future EEPS savings BUT the portion of programmatic vs. codes and standards is unknown
	• Integrated programs allow Hawaii to hit several targets at once including EE and grid services
	• HVAC and water heat are the most cost-effective target end-uses for integrated programs
		• No major changes are needed to Hawai'i Energy's portfolio
		  • There is a likely benefit from measure diversification
		  • Hawaii should evaluate the appetite for integrated programs and future rate-based options
		  • Programs will need to plan for various future states with respect to standards

THANK YOU!

TED POPE

ENERGY EFFICIENCY MANAGER TEAM

PERSPECTIVES FROM THE EEPS REVIEW

CURRENT STATE

EEPS PERFORMANCE DURING THE FIRST DECADE

- EEPS interim goals have been met from 2009-2018
- Hawai'i Energy has been delivering a large share of EEPS goal savings and reliably delivering savings relative to its annual plans (as verified)
- Two additional "Other Contributing Entities" – codes/standards and KIUC – as well as "naturally occurring" savings contributed most of the remaining savings
- On average, the EEPS impacts have been much cheaper than the avoided cost of power

EVOLVING HAWAII LANDSCAPE

- The context for energy efficiency in Hawaii has changed significantly since 2012 when the EEPS Framework was adopted; it has even changed since the EEPS First Review Period (2009-2015)
- EEPS complements but could better support newer Hawaii policy goals, such as Energy Optimization, Carbon Neutrality and Resiliency

COVID Economic Impacts	Customer-Sited DERs	Variable Generation in Utility Mix	Customer Technologies

ENERGY OPTIMIZATION OPPORTUNITY

- The Baseline Study and Market Potential Study completed by AEG confirm that substantial savings remain in Hawaii for both "anytime" energy efficiency, and energy optimization (efficiency and demand flexibility)
- The Commission has actively supported increased development of energy optimization strategies and sees the opportunity increasing
- Development of hourly avoided costs will:
  - Clarify the time-dependent economic value of the energy efficiency and other energy optimization impacts delivered by the PBF portfolio and Other Contributing Entities
  - Support expanded potential for a variety of energy optimization market interventions

PROGRESS ON TWG EEPS "HOPES AND DREAMS" LIST

Achieved

- Confirmed EEPS metric ("cumulative persisting savings")
- Updated Avoided Costs
- Hourly load shapes
- C&S and naturally occurring conservation estimates
- Evaluated the impact of EE in buildings with DG
- Increased focus on ALICE and HTR customers
- Launched energy optimization
- Market transformation metrics enhancements
- PBF surcharge changes

In Progress

- EEPS updates
- New impact metrics to be initially used for PBF reporting
- IGP-generated, updated Avoided Costs
- Strategies for development and valuation of integrated energy efficiency with DR, and other DERs

LOOKING AHEAD

EEM PERSPECTIVES – THE ROAD AHEAD

Hawaii and specifically the Commission have wisely established robust policy goals and guidance that directly and indirectly support a clean energy future. Energy efficiency is an important element of this vision. The EEM believes the following focus areas merit continued attention:

1. Policy and support for activities to address time and location value, demand flexibility, and other grid services needs that can be provided from behind the customer meter as part of an increasing investment in energy efficiency activities
2. Research and pilots to inform performance and benefits assumptions about energy optimization interventions
3. Optimal coordination between PBFA and HECO with respect to data, load forecasts, demand flexibility and grid services initiatives
4. Energy efficiency and energy optimization interventions that ensure that moderate and low income and other hard-to-reach customers are equitably served

PROMOTE ENERGY OPTIMIZATION

When implementing energy efficiency programs, integrate other elements of energy optimization at the same time, including:

- Promote DER-ready equipment and systems capable of responding to DR events ("shift, shed and shimmy") to provide on-call resources to the grid if/when connected to utility or aggregator signal (i.e., building as flexible grid resource)
- Promote smart appliances that operate independently to ameliorate grid challenges (e.g., water heater with circuit for frequency and voltage anomaly response)
- Promote controls for equipment that can support energy optimization strategies, both manual and automatic
- Coordinate with HECO to support utilization of DR-ready capacity

PURSUE COST-EFFECTIVE ENERGY EFFICIENCY

Over the next five years, Hawaii should increase its investment in cost-effective energy efficiency and energy optimization (especially where it can lower supply costs) by:

Measure Mix	Cost-Effectiveness	Pilot Efforts	IGP Model
• Optimizing PBF portfolio measure mix to save energy where and when most needed on the grid • Time and location value	• Establishing approaches for evaluating cost-effectiveness for energy optimization benefits	• Scaling effective energy optimization strategies proven through pilot efforts	• Making energy efficiency an optimizable resource input in the IGP models of the future

COORDINATION WITH OTHER ACTORS IN THE ENERGY SECTOR

Multiple market actors beyond Hawai'i Energy must coordinate their activities across silos to achieve the State's energy and climate goals in a cost-effective and timely manner.

- HECO – particularly in the areas of data sharing, identifying grid services needs, and coordinating DER planning and initiatives, especially with respect to outreach, incentives and tariffs
- Community organizations
- Professionals and professional organizations
- Military installations
- State and local government agencies (e.g., State Energy Office) – particularly on the implementation of energy optimization in public buildings and the adoption of and compliance with energy codes and standards

DATA ACCESS

HECO, as the grid operator, needs data to assess the potential, operation, and optimization of distributed energy resources utilized to provide demand flexibility. This will include time- and location-differentiated avoided costs and real-time demand data. The latter would be available through AMI and/or building automation systems that communicate with HECO.

Depending on the extent of Hawai'i Energy's role in supporting grid flexibility, they will either need:

- Data to properly target their efforts, define metrics, and assess their performance, and/or
- Clear direction from HECO or others indicating what demand side resources Hawai'i Energy should support (e.g., via market transformation efforts or direct incentives) and the specifications of such resources so that those procured do meet HECO (grid operator) requirements

THE HAWAI'I ENERGY CONNECTION

- Commission's Order approving Hawai'i Energy's Triennial Plan highlights time and locational value of energy efficiency (and by implication other DERs) and the importance of these resources in supporting the utility's integration of renewable resources into the grid
- Hawai'i Energy has proposed activities that support demand optimization. Most of these are under development and require additional details and justification
- To this end, the EEM has identified several areas of focus for these initiatives:
  - Market transformation
  - Metrics
  - Customer Segments
- Additional Hawai'i Energy program insights next week at TAG meeting on October 8

QUESTIONS?

Please contact Ted Pope at 510-462-0091 or tedpope@2050partners.com. Meeting materials will be posted on www.HawaiiEEPS.org

APPENDICES

AEG
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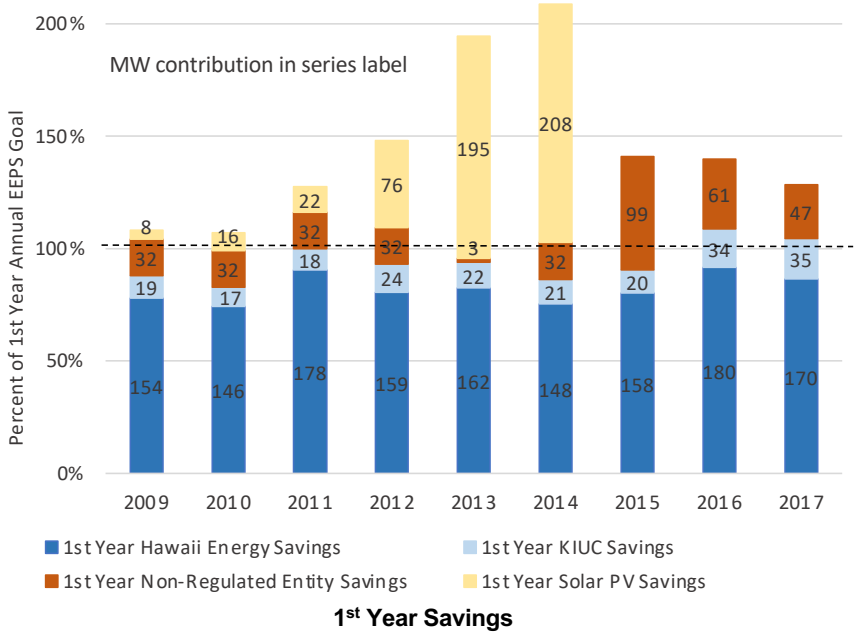
PAST EEPS SAVINGS

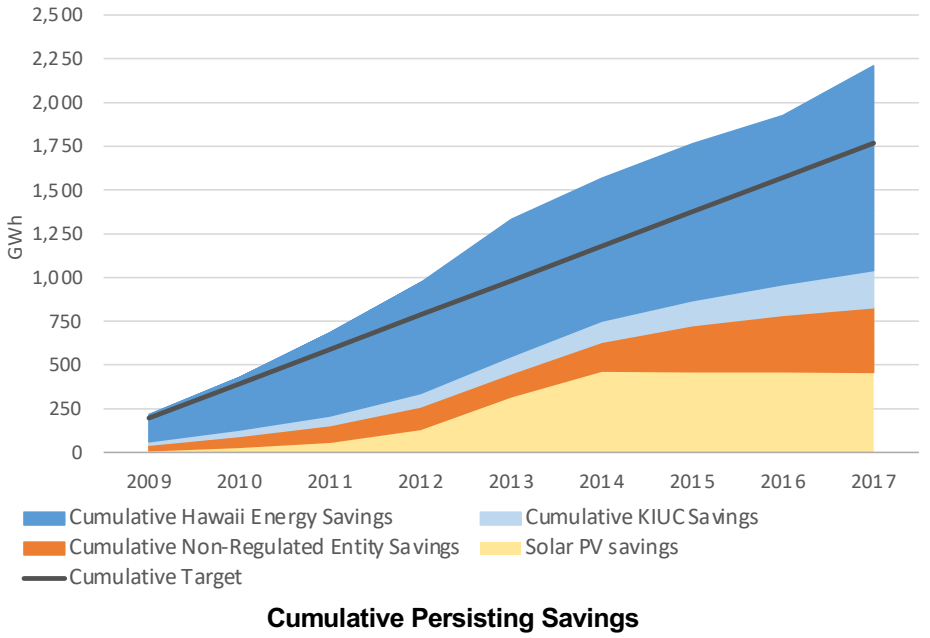
Is Hawai'i Meeting the EEPS Goals?

EEPS Savings by Entity Over Time

- Through 2017, the State of Hawai'i met and exceeded the EEPS goal relative to 1st year and cumulative persisting savings metrics.
- Hawai'i Energy is the largest contributor, with codes and standards (nearly all non-reg savings) coming in 2nd.



1st Year Savings



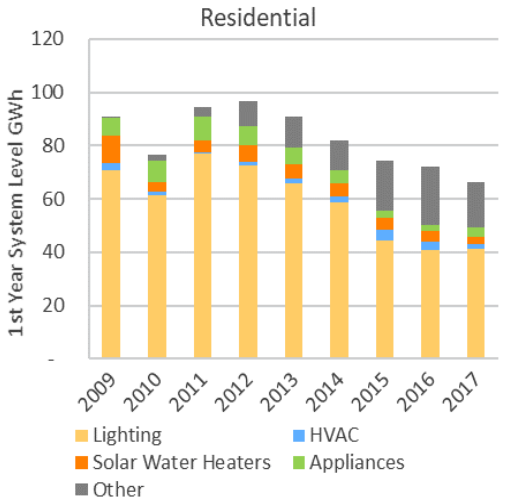
Cumulative Persisting Savings

WHO / WHAT ARE THE MAJOR CONTRIBUTORS TO SAVINGS?

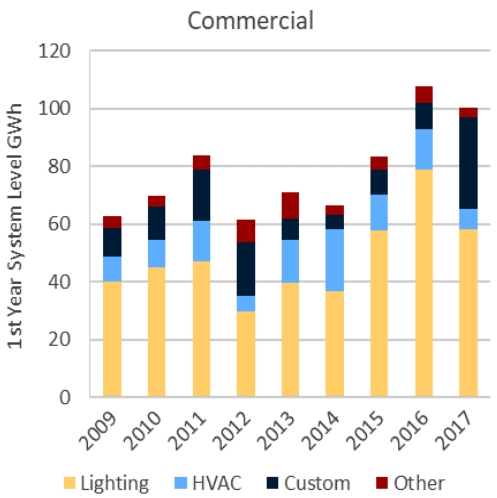
HAWAI'I ENERGY 2009 - 2017

Program Year	Demand Reduction (MW)	1st Year (GWh)	% of Total 1st Year (GWh)
2009	31	154	72%
2010	23	147	70%
2011	24	178	71%
2012	21	159	55%
2013	24	162	42%*
2014	26	148	36%*
2015	28	158	57%
2016	26	180	65%
2017 (reported)	25	170	67%

*Share is smaller because there were large contributions from Solar PV



- Savings are shifting from away from residential over time - 60% in 2009 vs. 40% in 2017
- Lighting savings are dropping over time, while savings from other measures (Peer) make up an increasing percentage of the total.



- Savings are shifting toward commercial over time – 40% in 2009 vs. 60% in 2017.
- Lighting savings have increased over time (on average) while savings from other measures have fluctuated.

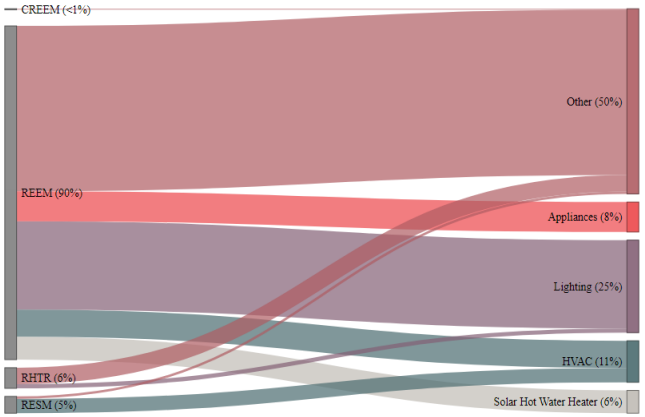
WHO / WHAT ARE THE MAJOR CONTRIBUTORS TO SAVINGS?

HAWAI'I ENERGY 2018

Residential 1st Year Demand Savings

Dominated by REEM program (90%)

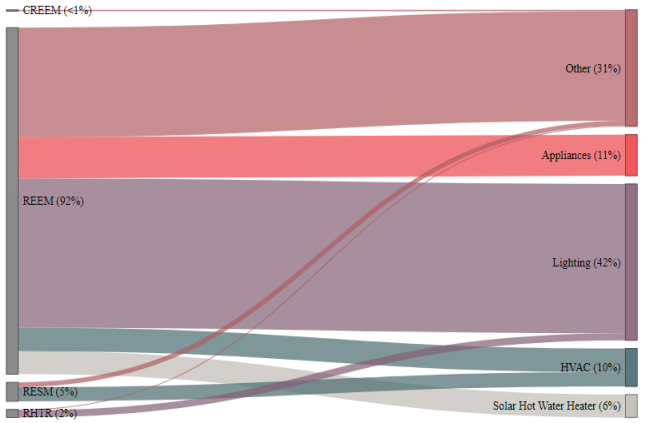
Majority of demand savings from Other (50%)



Residential 1st Year Energy Savings

Dominated by REEM program (92%)

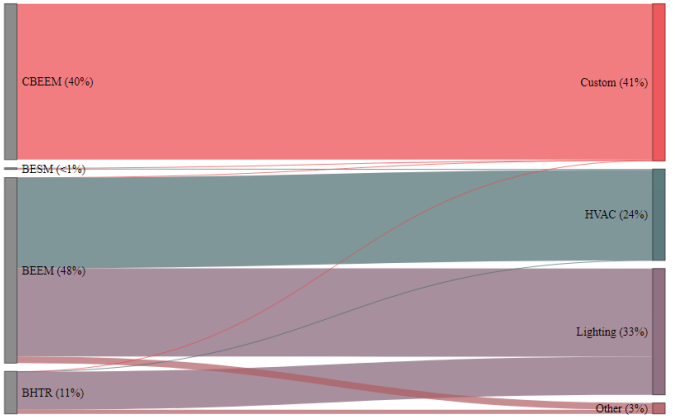
Highest proportion of energy savings from Lighting (42%)



Commercial 1st Year Demand Savings

Dominated by BEEM and CBEEM programs (88%)

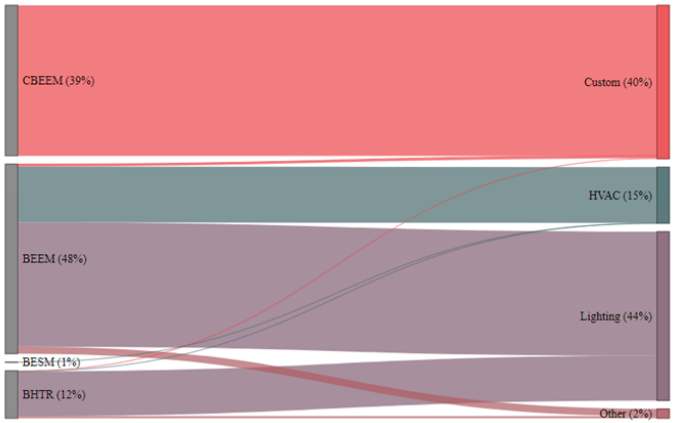
Highest proportion of demand savings from Custom (41%)



Commercial 1st Year Energy Savings

Dominated by BEEM and CBEEM programs (87%)

Highest proportion of energy savings from Lighting (44%)



Can we Improve the Robustness of the Savings Estimates?

TRM Updates and TRM Framework

Team used a prioritization approach to target measures for updates and review

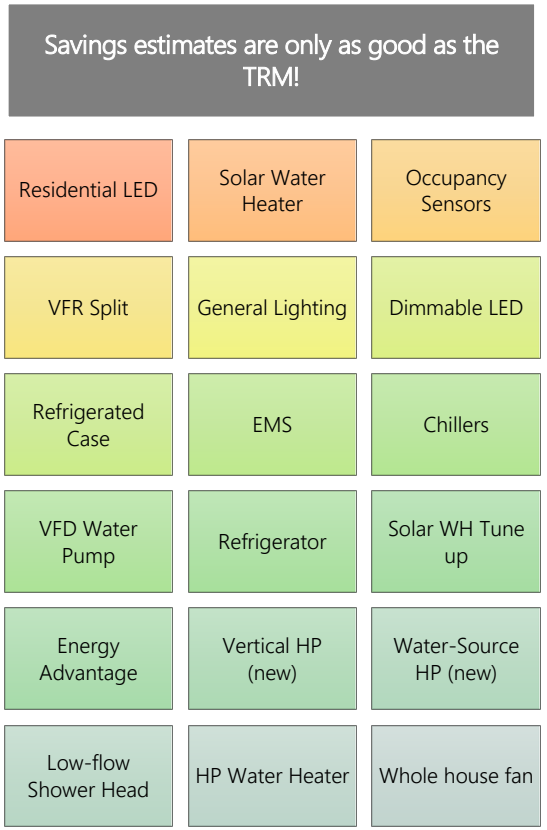
Last major review was conducted in 2012

PY2019 Reviewed 20 high priority measures across a variety of metrics

- **Align baselines** with current market conditions and codes & standards changes
- **Benchmark algorithms** against industry best practices
- Incorporate newer, more **applicable data** to estimate values for key parameters and metrics
- Modify measures to **reflect program changes**

PY2020 included an additional 11 measures and several overarching activities

- **Codes & Standards** Tracking Sheet
- Incorporation of **2019 Baseline Study data**
- Clarification of **TRB calculation** for single vs. dual baseline measures
- Clarification of two baseline periods for **dual baseline measures**

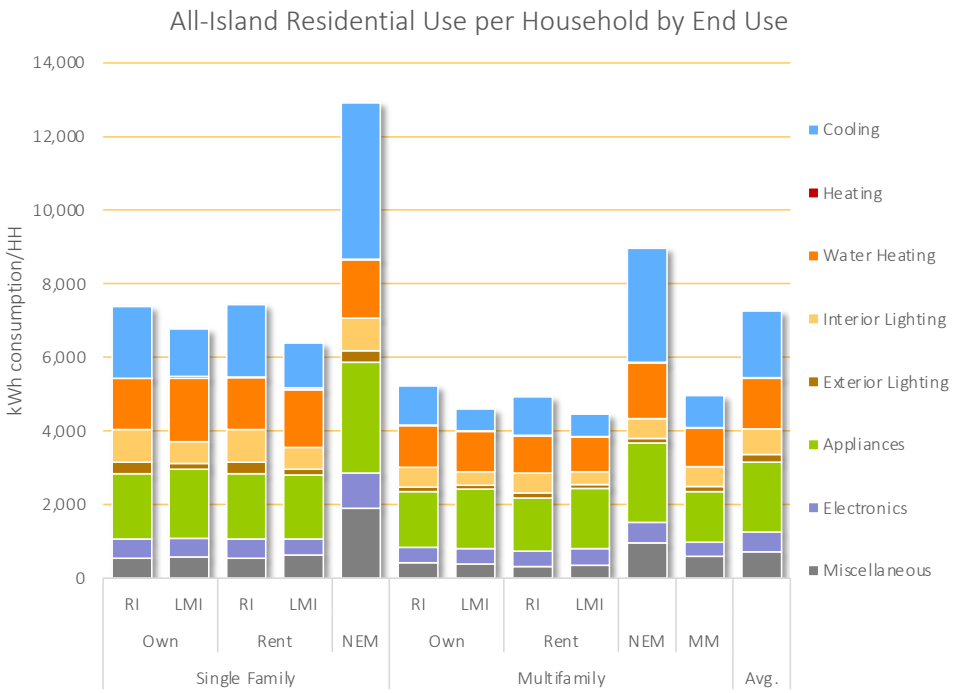


ENERGY CONSUMPTION CHARACTERISTICS

What Trends Affect Residential Customers?

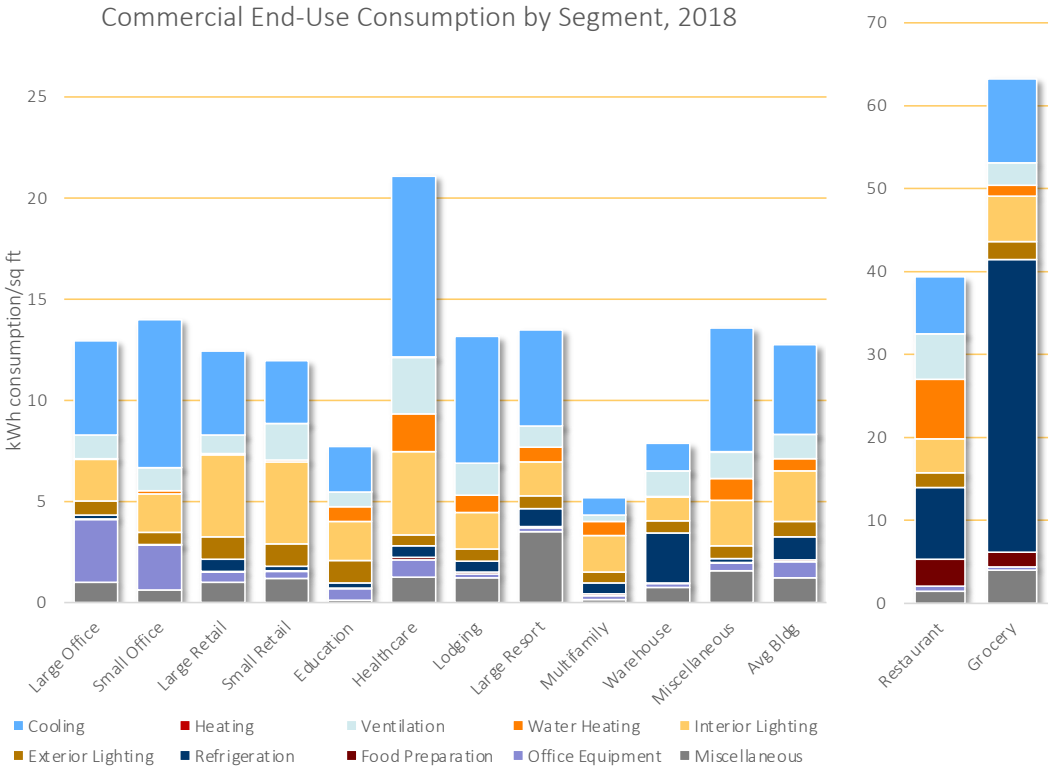
Including focus on those with DERs

Space Conditioning	•52% do not have air conditioning (cooling) •Air conditioner saturation is increasing
Solar Power	•28% have solar PV and most want to save money and environment. Most use their AC more often •26% have solar water heaters
EVs	•16% of respondents currently have an EV •More than half say they will buy in the future
Lighting & Electronics	•41% of sockets have an LED bulb •Average of 2.4 TVs per household
Awareness	•Majority of customers aware of programs •More than 1/3 have participated
Purchasing	•Efficiency is main driver •Most purchase LEDs; 91% of those also purchase ENERGY STAR



What Trends Affect Commercial Customers?

Small and medium business (SMB) Definition	•Less than 1 MM annual kWh •Excludes Government, Military, Water/Irrigation, AOAO
Space Conditioning	•60% have space smaller than 5,000 square feet •70% have and pay for cooling •16% report having solar PV
Lighting & Electronics	•75% have no incandescent / halogen bulbs •41% have no traditional linear fluorescents
Awareness	•Support is high for efficiency and renewables •Less than half are aware of programs and less than 25% participated
Purchasing	•Efficiency is main driver •LED Lamps and ENERGY STAR equipment
EVs	•Saturation likely to remain flat •6% currently have an EV and 11% indicate they will purchase one
Technologies	•Solar water heaters •Smart thermostats



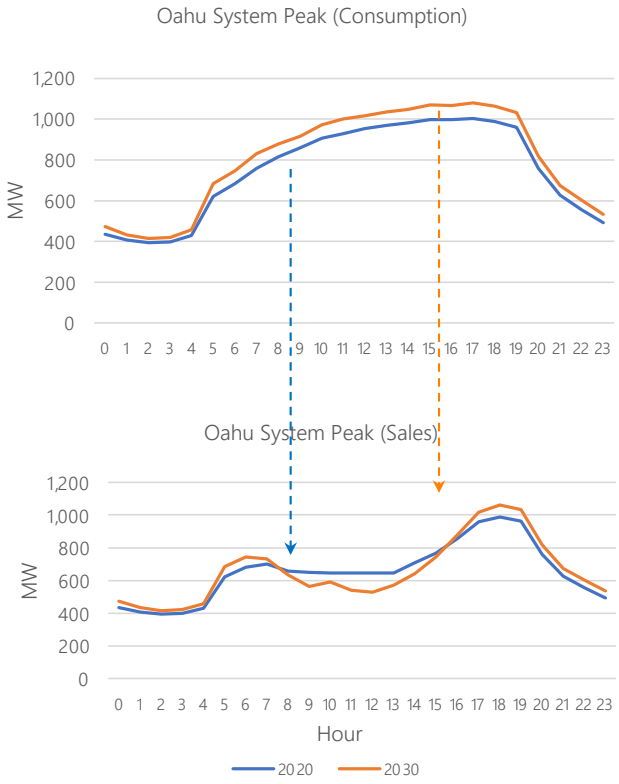
Addressing Savings at the Grid Edge

AEG assessed savings relative to consumption rather than sales

- In this context all the savings from various efficiency measures and interventions are realized in the form of lower consumption
- Changes in sales are based then on the adoption of PV but also considers the fact that NEM customers have higher consumption on average

Figures to the right compare hourly load profiles for baseline consumption and sales in 2020 vs. 2030

- Consumption increases but sales dip during midday due to continued adoption of customer-sited PV



NOTES FROM SLIDES

THIS SECTION INCLUDES SLIDE-SUPPORTING NOTES FOR THEIR ASSOCIATED SLIDES

Slide #1

Welcome by Commissioner Potter

- Welcome back and thank you to those who continue to participate and provide invaluable input to the development of our research, direction and goals.
- AEG and the EEM have prepared an outstanding presentation for you today.
- The research results and insights encourage next generation demand side management, including integrated resources that are able to meet grid needs.
- Hawaii has an advanced energy ecosystem where traditional solutions are becoming outdated— we need to evolve our programs to be inclusive, diverse and promote equity.
- Nationally our energy efficiency programs are raising the bar.
- TWG, TAG, EEM, HE, AEG, PUC, and HECO are the village that makes energy efficiency relevant in Hawaii. Through collaboration and crowd sourcing over the past several years we have reached our annual goals, reached our communities.
- Our job in the coming years is critical for reaching goals and serving the people of Hawaii. With the devastating impact of COVID on health and economy, we have a responsibility to act to protect the vulnerable populations and set the stage for lasting economic recovery. Energy Efficiency has always been the most effective way to reach residents. We can serve our community through customer facing programs that provide financial relief while promoting job growth. Let's develop programs that reflect the research findings developed in the last year so that we can accomplish the goals of serving our community and meeting our clean energy goals.
- AEG and the EEM have some exciting research to share with you today. I want to thank you all for your dedication to EEPS and the process we undertake to meet our goals. Mahalo!

Slide #5

- The last baseline study was completed in November 2013 by Evergreen Economics
- That last Potential Study was completed in early 2014 by EnerNOC
- Roles:
  - Commission – lead the review, set priorities, make determinations
  - TWG – make recommendations, provide expertise and perspective, information on TWG-based activities and policies, review and comment on documents and reports (informally and occasionally via the EEPS Docket)
  - EEM team – support the Commission, facilitate TWG, prepare summary reports, manage EEPS EM&V
  - EEPS EM&V – evaluation, measurement & verification, conduct baseline and market potential studies, and provide additional analytic support as needed throughout

Slide #6

In September 2017, the TWG did a "hopes and dreams" exercise. The EEM took that input and boiled it down to approximately four slides which we shared in the subsequent February 2018 TWG meeting.

The list included the following "hopes and dreams:"

- Develop avoided costs that distinguish between capacity and energy, include benefits of ancillary services
  - Note that as avoided costs of renewable energy drops, energy efficiency is less attractive unless there are enhancements
- Need additional information, including EE load shapes, impacts of all EE including programs, codes & standards, and naturally occurring conservation
  - Need granular projections
- Encourage more rapid implementation of EE activities and integration of EE with other distributed energy resources (DER) support
- Improve EV projections:
  - Although EV does not count toward EEPS goals, EV information is needed for the forecasts
- Determine how to address storage in the EEPS process
  - Recommend excluding it – HECO is characterizing storage as a load-shifting measure
- Given that the original goal of the Hawaii Clean Energy Initiative was for EE to offset imported fossil fuel generation, re-consider EEPS goals given that now, some EE is offsetting local renewable generation
- How to incorporate technologies with multiple functionalities (EE, DR, DG)?
- Consider customer equity and PBF equity; special attention to hard-to-reach customers
- Ensure that market transformation is properly valued
- Integrate DERs logically into the planning processes. More than one entity can work to deploy these resources, and many hands make light work.
- Adjust the PBF surcharge so that it does not fall disproportionately on customers w/o access to DERs
- Consider a Societal cost test that assigns value to benefits (e.g., serving hard to reach customers)
- Consider a ratepayer benefit test
- Get EE data from the military and other sources (e.g., state buildings – Hawaii Energy has some, but need additional info)

Slide #16

- Reviewed MPS measure-level results, focusing on measures that are most impactful with respect to cumulative Achievable High savings by 2030
- Identified a set of metrics for each measure
  - Impact toward EEPS goal – contribution to cumulative savings target in 2030
  - Load-reduction potential by time-of-day

Slide #17

- PBFA Programs: Mix of measures
- PBFA Programs or New C&S: Mostly lighting
- DR/GS: Mostly HVAC
- Existing C&S: Aerators and Low-Flow Showerheads

Slide #25

- EEPS Savings Review helped to quantify past savings and assess past savings vs. EEPS goals. It also supported the Verification and MPS work by documenting savings attribution.
- Verification work ensures the accuracy of past savings claims. It informs future program savings and is a key input to the MPS work informing potential savings assumptions.
- The TRM work ensures the robustness of future savings estimates and is informed by past savings. It also led to improvements in Verification and M&V activities.
- The Baseline study was primarily focused on characterizing energy consumption. This characterization is a primary driver of the potential study.
- The Market Potential Study leveraged all the previous work to focus on potential savings and future programmatic savings.

Slide #26

- EEPS Research Findings
  - State of Hawaii is on track to meet the 2020 interim EEPS goal
  - Current and past program portfolio relies heavily on lighting, behavioral (Res), and custom programs (C&I)
  - Hawai'i Energy programs have been, and continue to be, successful and cost effective
- TRM Findings – TRM update resulted in:
  - More accurate savings estimates
  - Some modifications and improvements to the implementation process
  - TRM Framework supports continuing improvement
- MPS Findings
  - Hawai'i Energy market transformation efforts, general technology improvements, and codes and standards may result in more lighting savings shifting into the baseline and out of programs

Slide #27

Baseline Study

- The lighting market is not completely transformed
  - 41% of residential sockets have an LED
  - 75% have no incandescents, 41% have no traditional linear fluorescents
- Residential EV saturations are rising;
  - 16% say they currently have an EV, more than half say they will purchase one in the future
- Residential net energy metering (NEM) customers consume, in total, more electricity than non-NEM customers
  - Higher usage is particularly evident in cooling, appliance, and miscellaneous loads

Slide #28

MPS Findings

- EEPS goals are achievable under the Business as Usual scenario
  - Assumes that program funding, non-regulated entities, and codes and standards continue to contribute in a similar manner
- EE Potential is highly concentrated in cooling, lighting, and water heating across both sectors
  - Lighting has substantial programmatic savings under the Tier 2 EISA rollback
- HVAC, EVs and water heating show substantial potential for grid services in both sectors
- Critical Peak Pricing rates show significant savings potential
  - Assumptions were not specific to Hawaii

Slide #29

MPS Findings

- Measures are evolving but will remain largely the same especially in the near future
  - Lighting, HVAC, water heating, and custom still have the highest savings and value
- Lighting will be a key component of future EEPS savings
  - The proportion of programmatic vs. codes and standards driven savings is still unknown
- Integrated programs allow Hawaii to hit several targets at once including EE savings and grid service capability
  - HVAC and water heating are the most cost-effective target end uses

Implications

- There is a likely benefit from measure diversification specifically including more HVAC and water heating
- Hawaii should evaluate the appetite for integrated programs and future rate-based options
- Programs will need to plan for various future states since EISA Tier 2 and other lighting standards will significantly affect program portfolios

Slide #34

- The economic impacts of COVID-19 are significant for program delivery and further increase the need for attention to low and moderate income and HTR communities
- Customer-sited, distributed energy resources (DERs), especially PV and storage, are proliferating
- Variable generation sources are providing a larger share of utility generation mix every year
- Customer technologies are evolving (e.g., grid-integrated buildings)
- EEPS complements but can better support newer Hawaii policy goals, such as Energy Optimization, Carbon Neutrality and Resiliency

Slide #43

Market Transformation

- There is a need to prepare the marketplace – both consumers and suppliers (services and products) - for a future where grid flexibility becomes common practice, supported by codes and standards, and influenced by retail tariffs. Examples include those identified by Hawai'i Energy in their Triennial Plan as well as other possible opportunities such as benchmarking programs.

Metrics

- Just as the Commission moves HECO towards PBR, they have always provided performance incentives for Hawai'i Energy programs. However, these incentives for (a) direct impacts have always been based on annual energy savings, primarily, and a simplified definition of demand savings, and (b) indirect impacts have always been activity-orientated. Moving forward, to support demand flexibility and market transformation, there is an opportunity to adjust or create new metrics that can focus on demand flexibility and outcomes.

Customer Segments

- Hawai'i Energy programs can, in combination with social programs, provide support to help Low-Income, Hard-to Reach and ALICE communities through the energy transformation underway, with both demand flexibility and energy efficiency services.