

Integrated Grid Planning Symposium

KIUC

PLANNING FOR LARGE SCALE RENEWABLES

NOVEMBER 16TH 2017

Panel 6:

Resource Planning Methods

Discussion on the integration of DER and
grid scale resources and the
optimization techniques. .

Agenda

- About KIUC
- Strategic Plan
- Economics
- Grid Capabilities
- System Operations

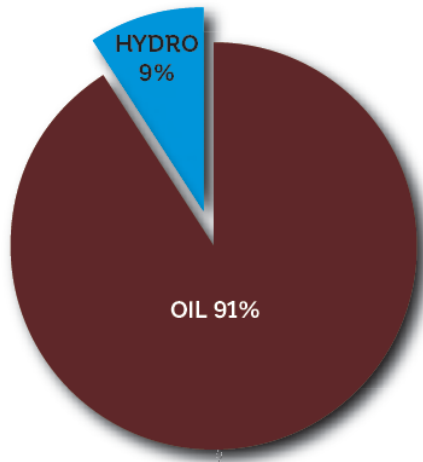


KIUC BY THE NUMBERS

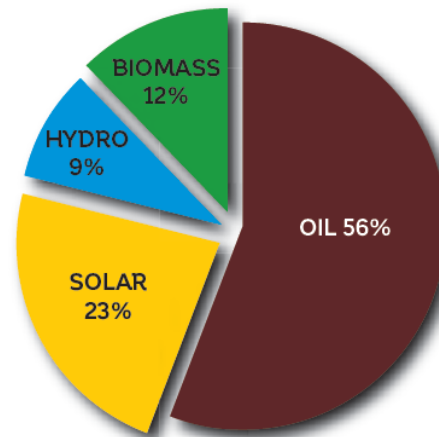
- ❖ **24,745** members
- ❖ **33,562** customer accounts
- ❖ **9** elected Board Members serving staggered 3-year terms
- ❖ **\$156 million** operating budget
- ❖ **123** megawatts total generating capacity
- ❖ **3,273** residential solar rooftop systems in service
- ❖ **\$25 million** in patronage capital returned to members since 2003
- ❖ **44 percent** renewable generation to be achieved in 2017
- ❖ **90** percent or more renewable power utilized in daylight hours on most sunny days
- ❖ **99.9** percent system reliability each year from 2014-2016

WHAT POWERS KAUA'I?

Fuel Mix 2010



Fuel Mix 2017



RENEWABLE PROGRESS FROM 2011-2016

- ❖ Successful integration of solar/photovoltaic sources
 - ◆ 31 megawatts of utility scale photovoltaic
 - ◆ 20 megawatts of distributed photovoltaic
- ❖ Re-establishment of biomass generation post-plantation era
 - ◆ Green Energy Team biomass plant providing 6.7 megawatts
- ❖ Dramatic reduction of fossil fuel use by 10 million gallons a year; a full one-third of our 2008 usage
- ❖ Regularly achieving 90 percent or more renewable generation during daylight hours on most sunny days
- ❖ Increase in reliability by 50 percent, mostly due to solar/PV integration



1. Anahola solar

- 12 MW, displaces 1.7M gallons of oil annually

2. Green Energy

- Burns woodchips, supplies 12% of island's energy

3. Koloa solar

- Produces power for 12 cents per kWh

These 3 projects produce 23% of Kauai's energy



RENEWABLE FOCUS 2017 AND BEYOND

- ❖ Leading the world in dispatchable PV at prices comparable to or lower than the present cost of oil
 - ◆ Solar City/Tesla project: First utility scale dispatchable PV system in the nation, serving customers during peak evening hours with 13 megawatts
 - ◆ AES Distributed Energy, Inc. project: Currently in permitting and expected to come on line in 2018, the project will provide an additional 20 megawatts of power during peak evening hours
- ❖ Exploring the use of innovative hydro pump-storage technology, utilizing daytime solar on Kaua'i's sunny west side to power a nighttime hydro generation system



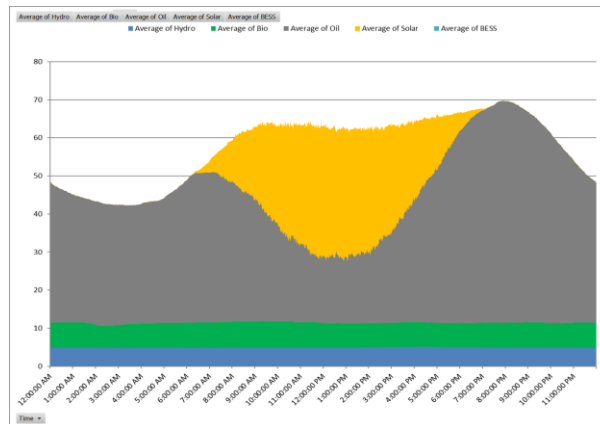
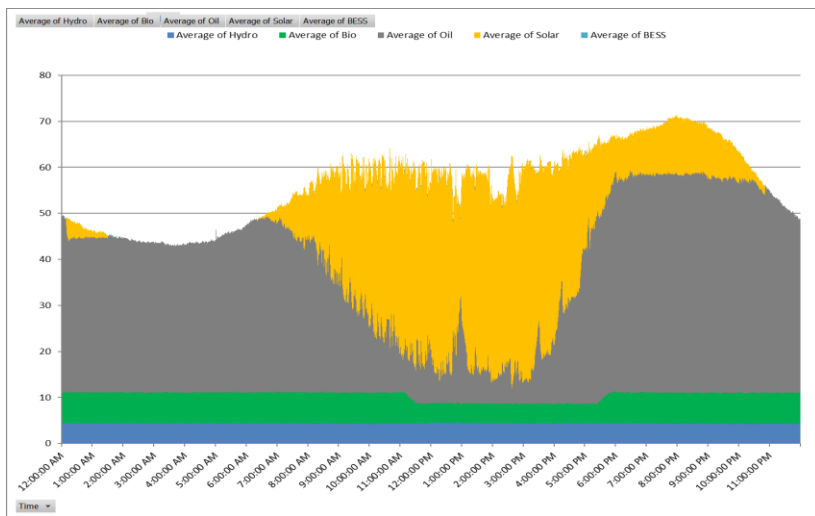
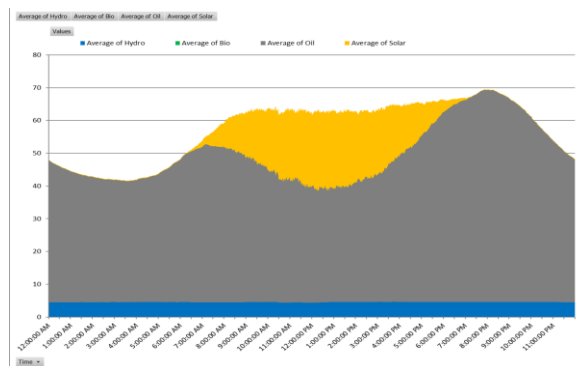
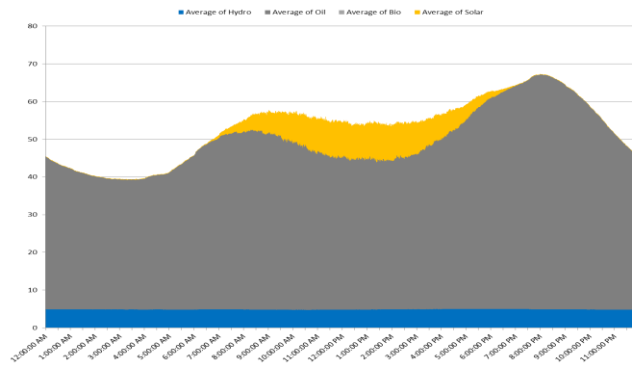
Strategic Plan

- “In 2008, the board of directors adopted an ambitious goal that would be embedded within nearly every aspect of its strategic planning. That goal is to use renewable resources to generate at least **50 percent of Kauaʻi’s energy by 2023.**”
- “As more renewables come on line, there is a clear expectation by members that their bills will go down. That desire is shared by the Board of Directors and staff members, who are committed to **aggressive cost controls** and intelligent deployment of the co-op’s resources.”
- “An adequate supply of energy would have **no meaning without a means to reliably deliver that energy to KIUC’s members and customers.** The shift to local, sustainable sources of energy also affects KIUC’s transmission and distribution infrastructure. This network must be maintained and upgraded to ensure that its high standards for safety and reliability continue to be met.”
- **2016 Update:**
 - Generate at least **70 percent of electricity by using cost effective renewable resources by 2030.** This achievement level will place KIUC ten years ahead of state mandates as we progress toward 100% renewable electric production by 2045.
 - Hold controllable **cost** increases at or below the actual level of inflation, and maintain system **reliability** at 99.96% or better availability.



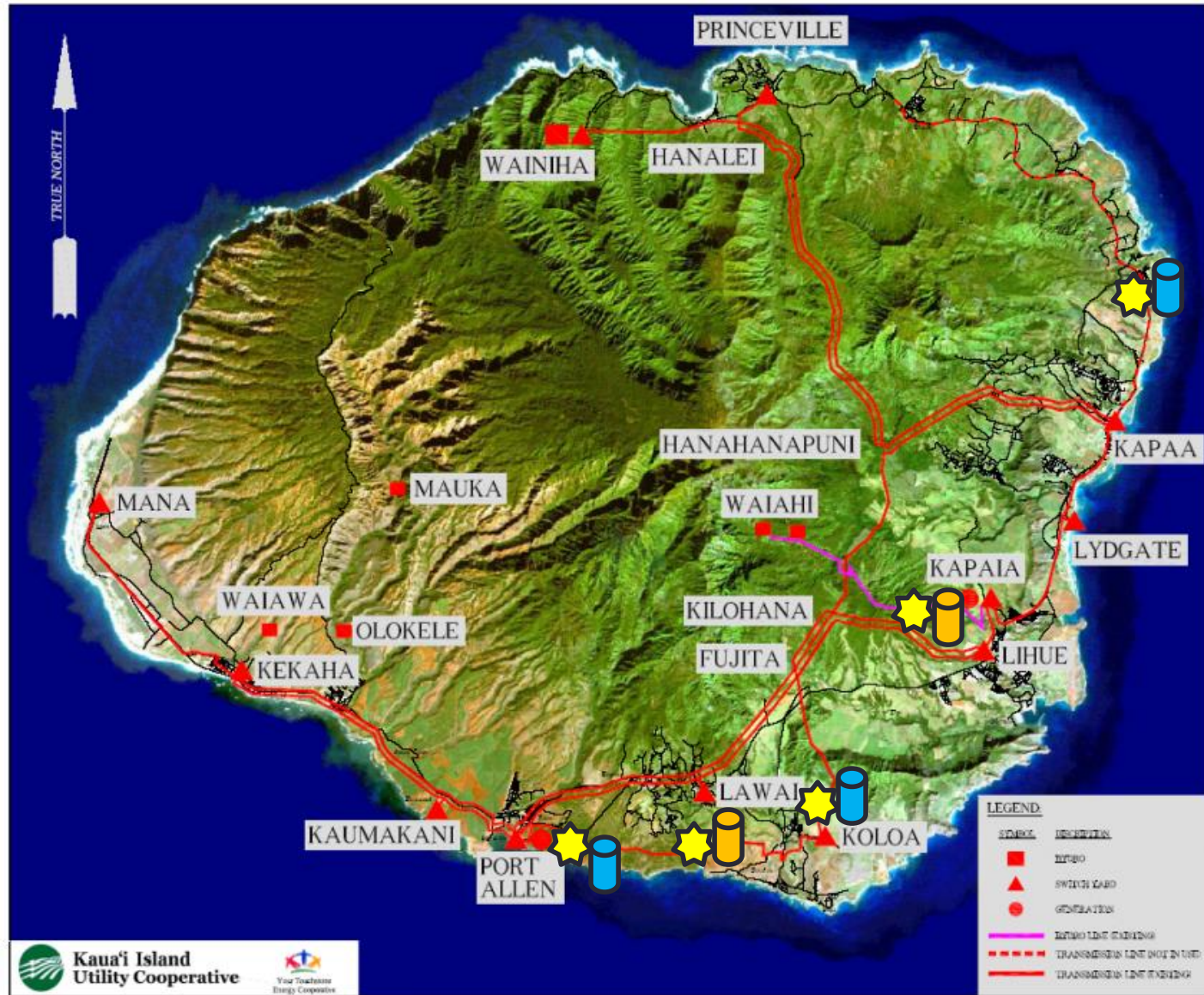
Economics

- Economics
 - Evolution of KIUC Dispatch (2014-17)
 - Cost of Generation
 - Relative to fossil fuel
 - Relative to other projects and technologies
 - UPLAN software
 - 20-25 year models
- Matching generation to load
- Relative to other benefits (Societal, Environmental, etc)



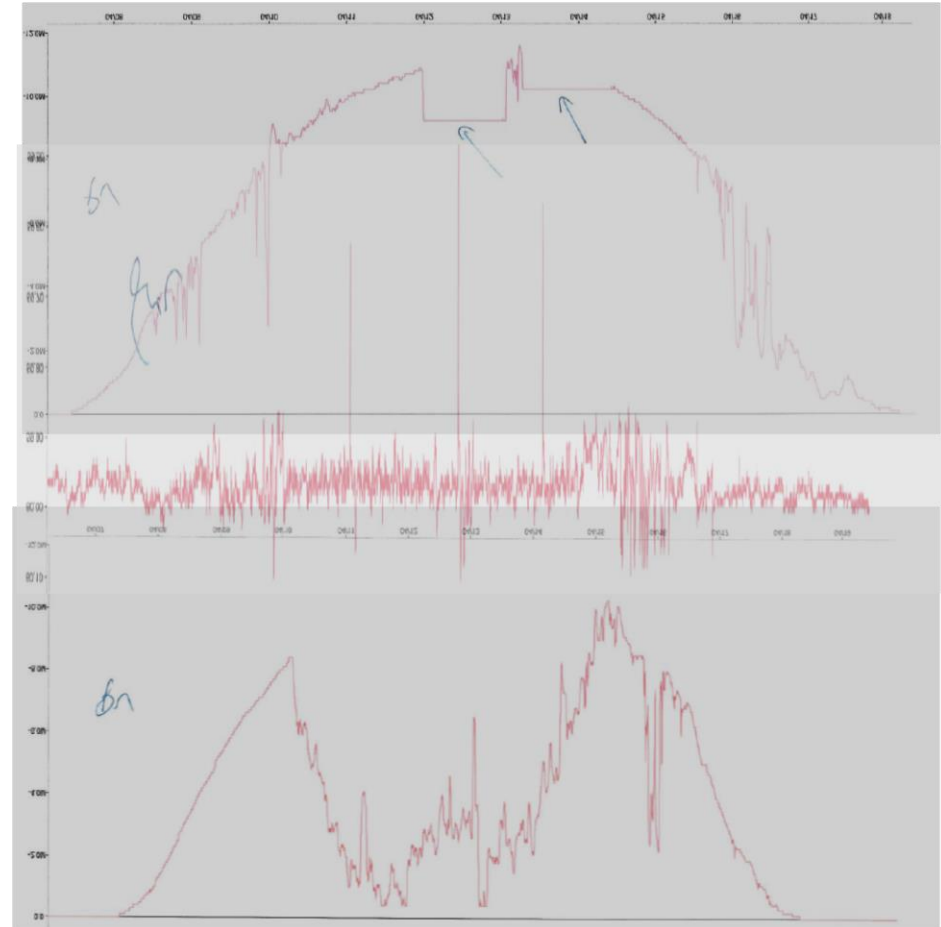
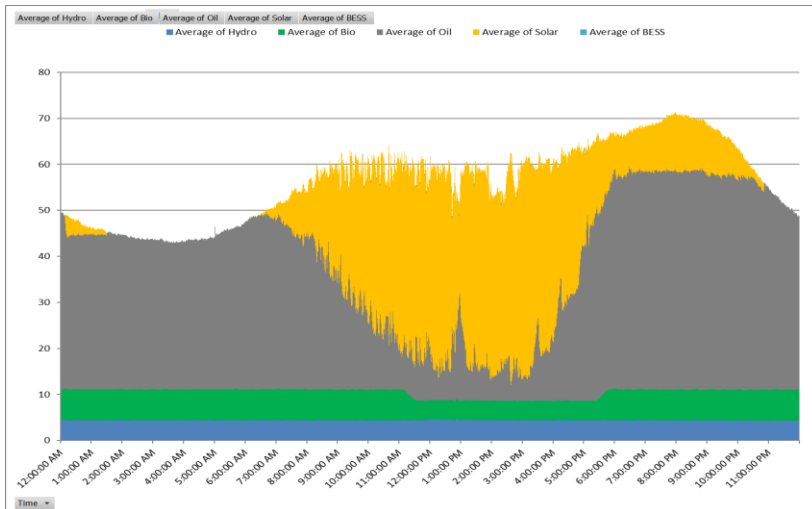
Grid Capacity

- Transmission and Distribution System Planning
- Project Siting
 - Near or at existing infrastructure
 - Design to increase reliability
- Know your grid
- Increase switching capabilities.
- Power Flow, Short Circuit, and Dynamics Models.
 - ASPEN, PSSE



System Operations

- Operational Planning
 - System Protection
 - Frequency Response
 - Voltage Response
 - Battery Energy Storage System
 - Ride through capabilities.
 - High Speed recorders



Thank You!

Michael V. Yamane P.E.
Chief of Operations
Kauai Island Utility Cooperative
myamane@kiuc.coop

