Integrating OTEC into Isolated Grids: Issues and Opportunities

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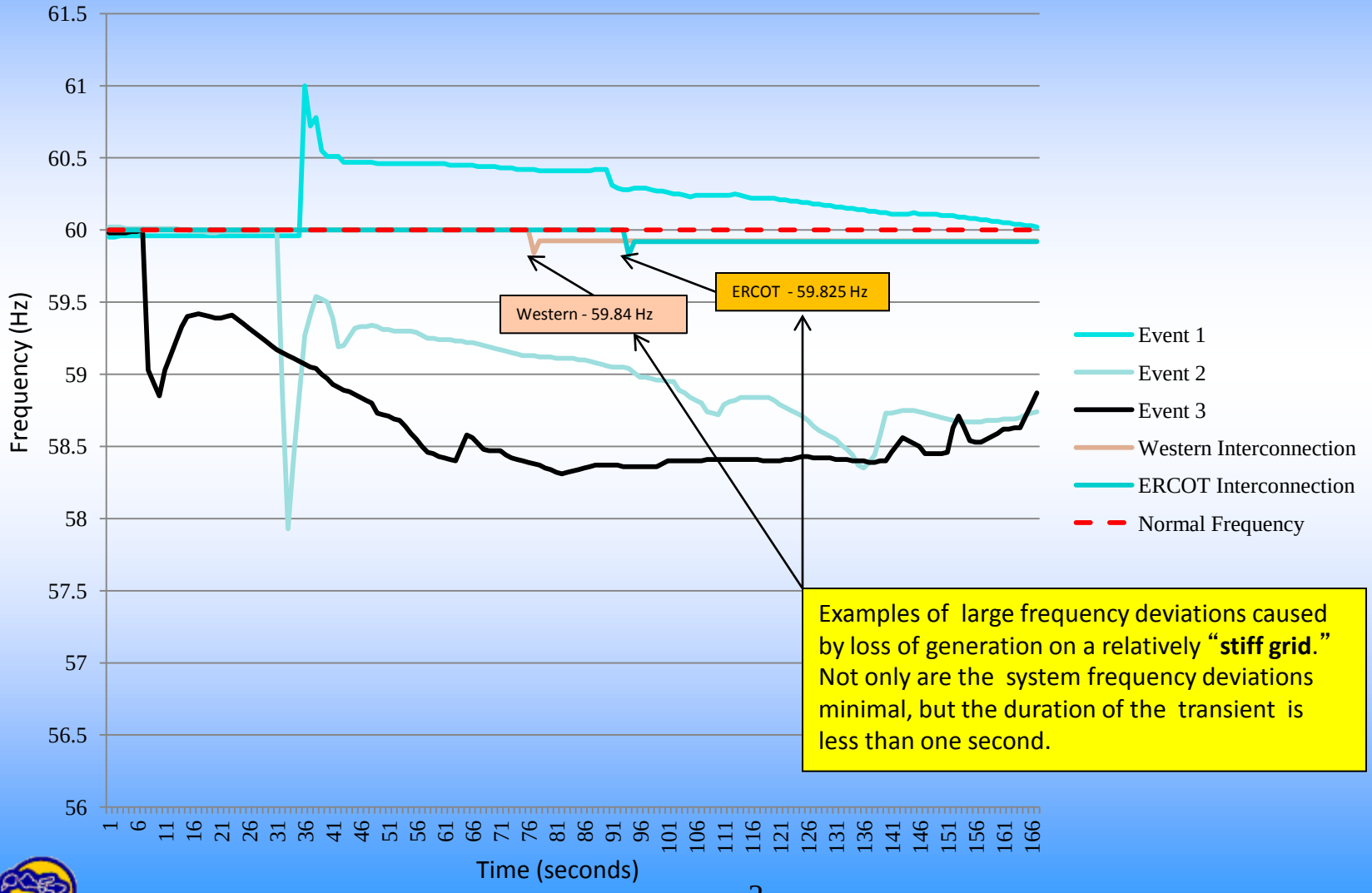
Small Grid Issues

- Forced outages and/or system faults cause greater frequency & voltage fluctuations.
- Island-specific generation mix (baseload, cycling, peaking, wind, PV, etc.)
- Impact of loss of largest generators relative to system load
- Penetration of as-available renewable generation relative to system load
- Limited disturbance response capability: Quick Load Pickup (QLPU)/Quick Load Rejection (QLR); Under Frequency Load Shedding (UFLS), Ride-through capability.
- Limited fuel diversity and dependence on imports

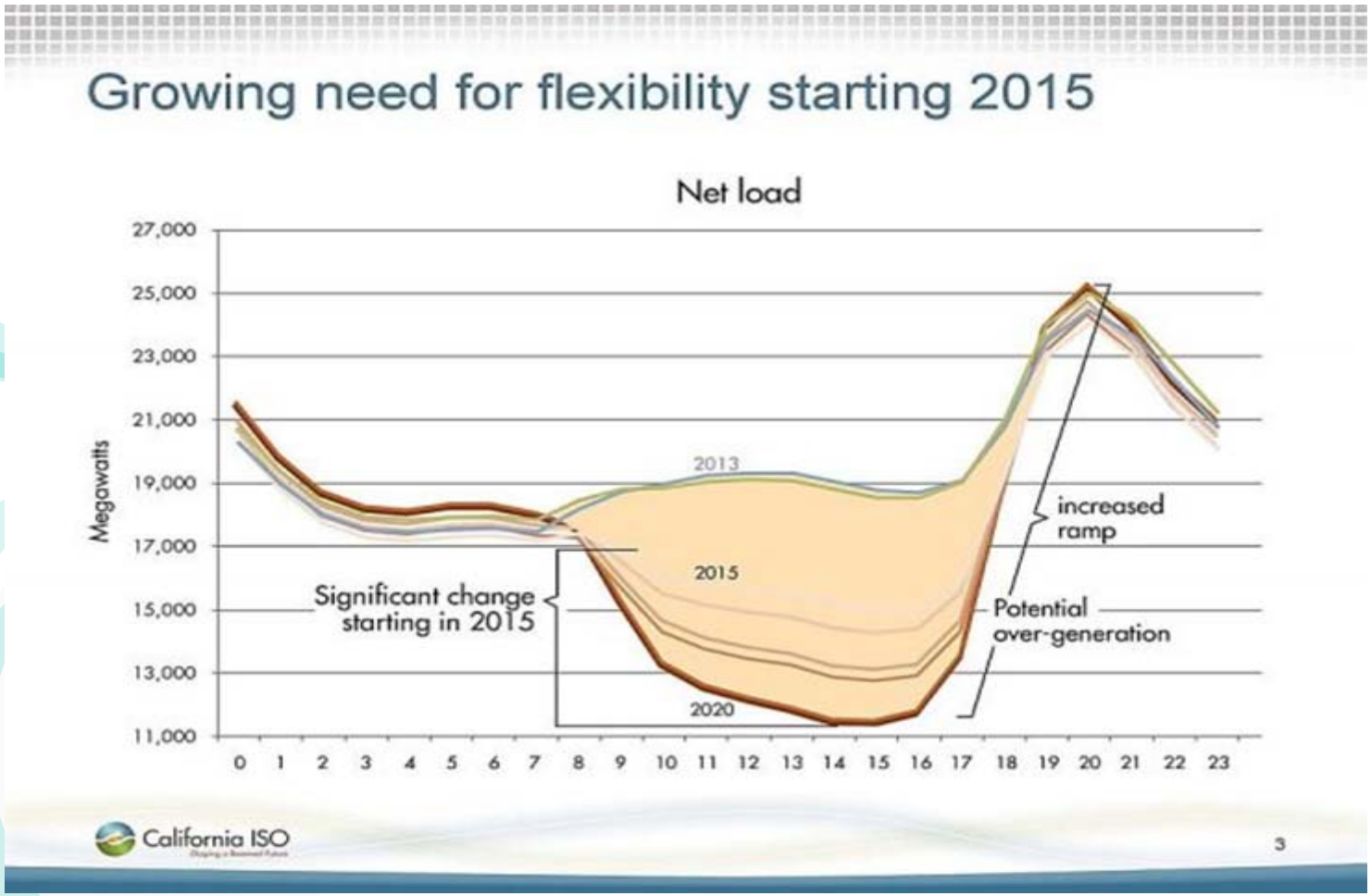
Large Disturbance Comparison

HECO's Island System vs. Interconnected Grid



Examples of large frequency deviations caused by loss of generation on a relatively "**stiff grid**." Not only are the system frequency deviations minimal, but the duration of the transient is less than one second.

California “Duck Curve”



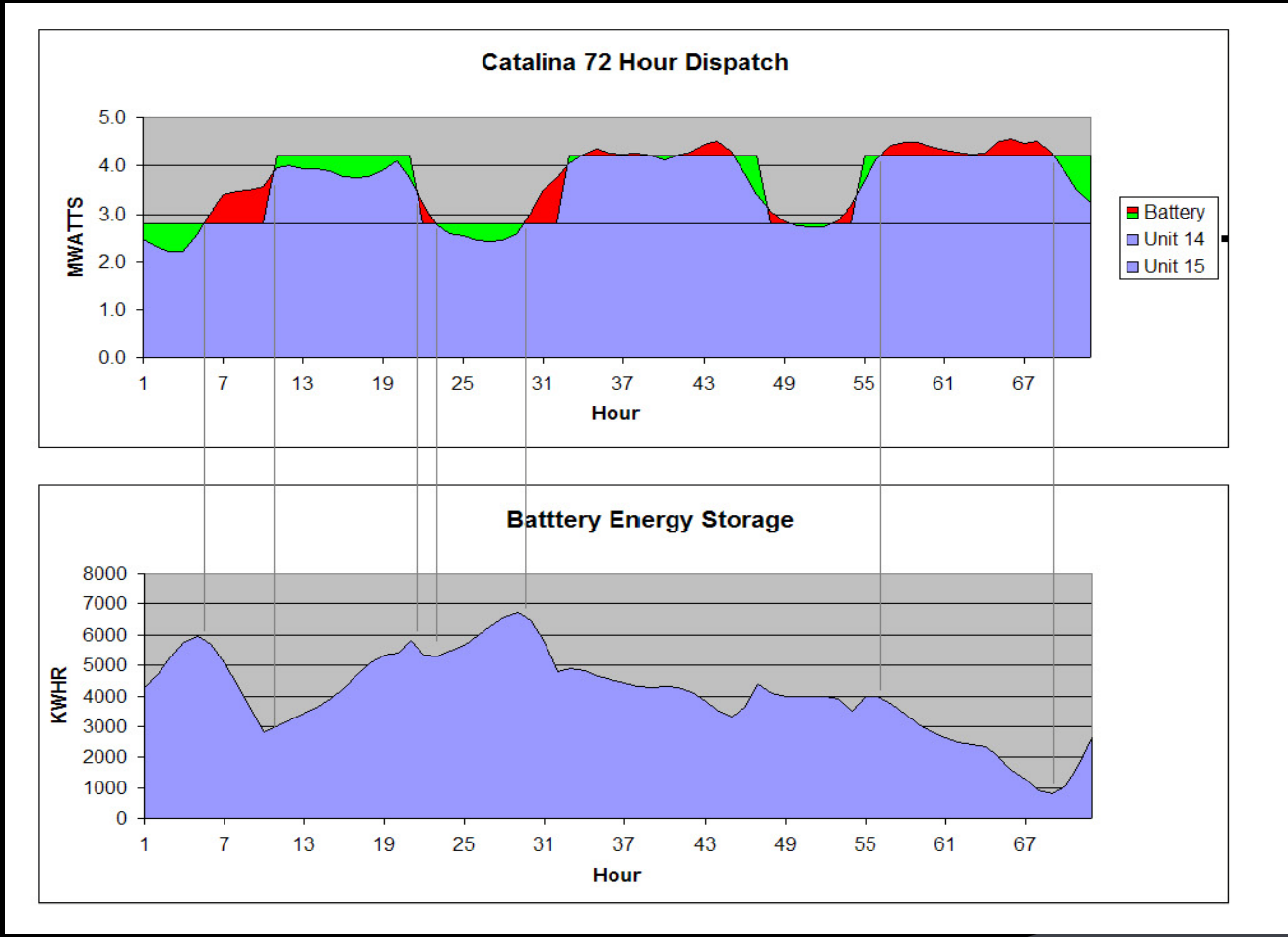
OTEC Characteristics

- Base Load Solar Energy (constant vs intermittent wind or solar pv)
- Eliminates need for backup generation when solar pv/wind are unavailable
- Dispatchable (controllable)
- Strong Ramp Rate - Quick Load Rejection and Pickup (inertia and droop)
- High Capacity Factor
- Black Start Capability

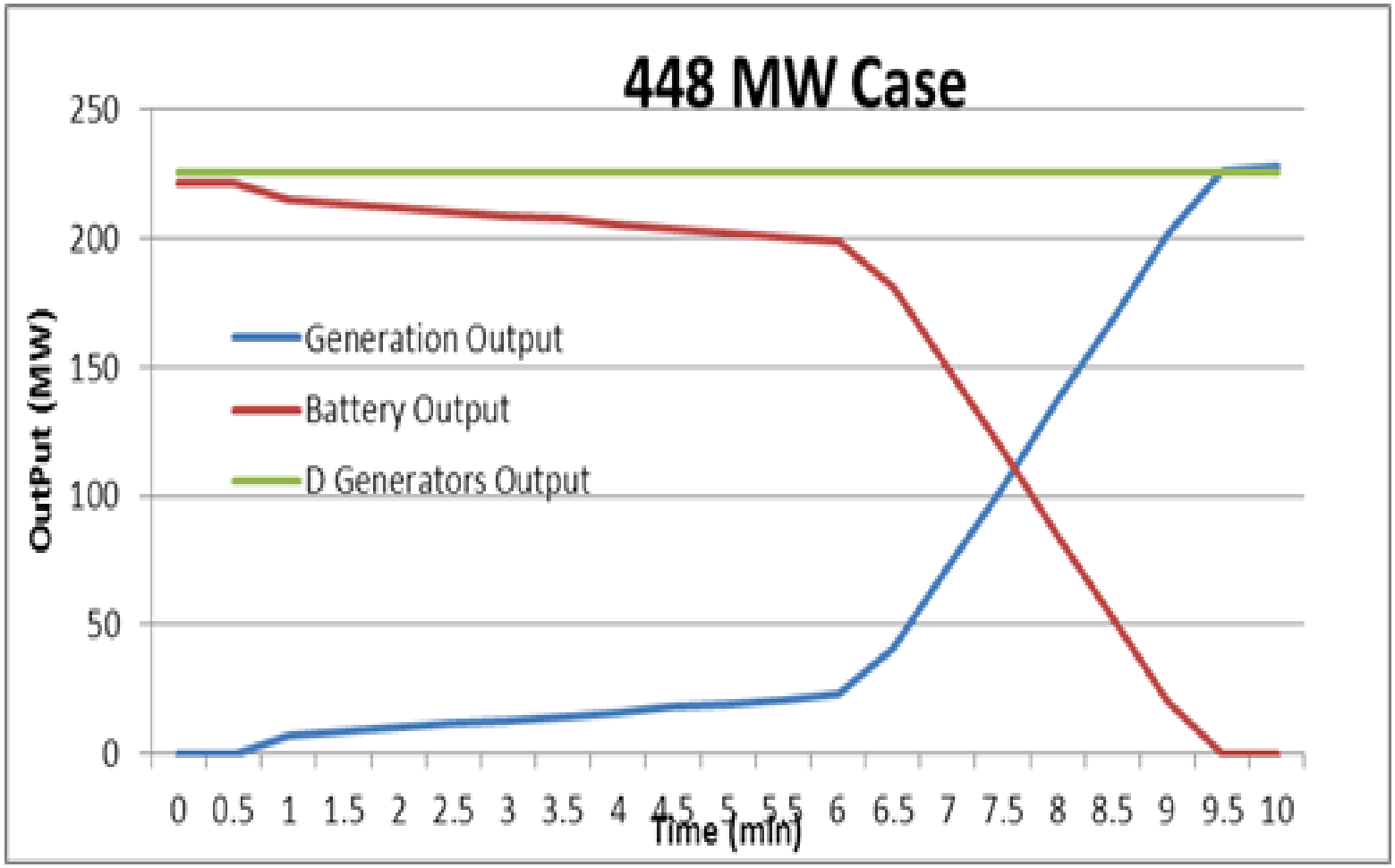
OTEC Offers Small Grid Opportunities

- High avoided cost → lower cost generating plants.
- Susceptibility to large frequency and voltage swings → ancillary services
- Large daily load swings → Energy storage/spinning reserve
- Limitless indigenous energy → breaking foreign fossil fuel dependence

Load Smoothing Peak Shaving SCE—Catalina Island



Storage as System Stabilizer



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