

OPALCO Outage Analysis

December 2017 Board Meeting

What causes power outages in the islands?

Wind

Major outages happen most often during wind storms - when winds are blowing above 30 miles per hour.

As our wonderful forests age, trees become taller and more susceptible to blowdown, especially alongside roads where our transmission lines run.

Older trees also often have interior rot that weakens them.



Rain

Our wet winters loosen the holding power of soils, and perfectly healthy trees will lose their grip and topple over, taking out power lines.

Rainy weather also increases the conductivity of soil - old buried cable, installed in the 1960s and 70s, which are reaching end of life, can be are more likely to fail.

The cycle of very wet winters and very dry summers exacerbates the problem.



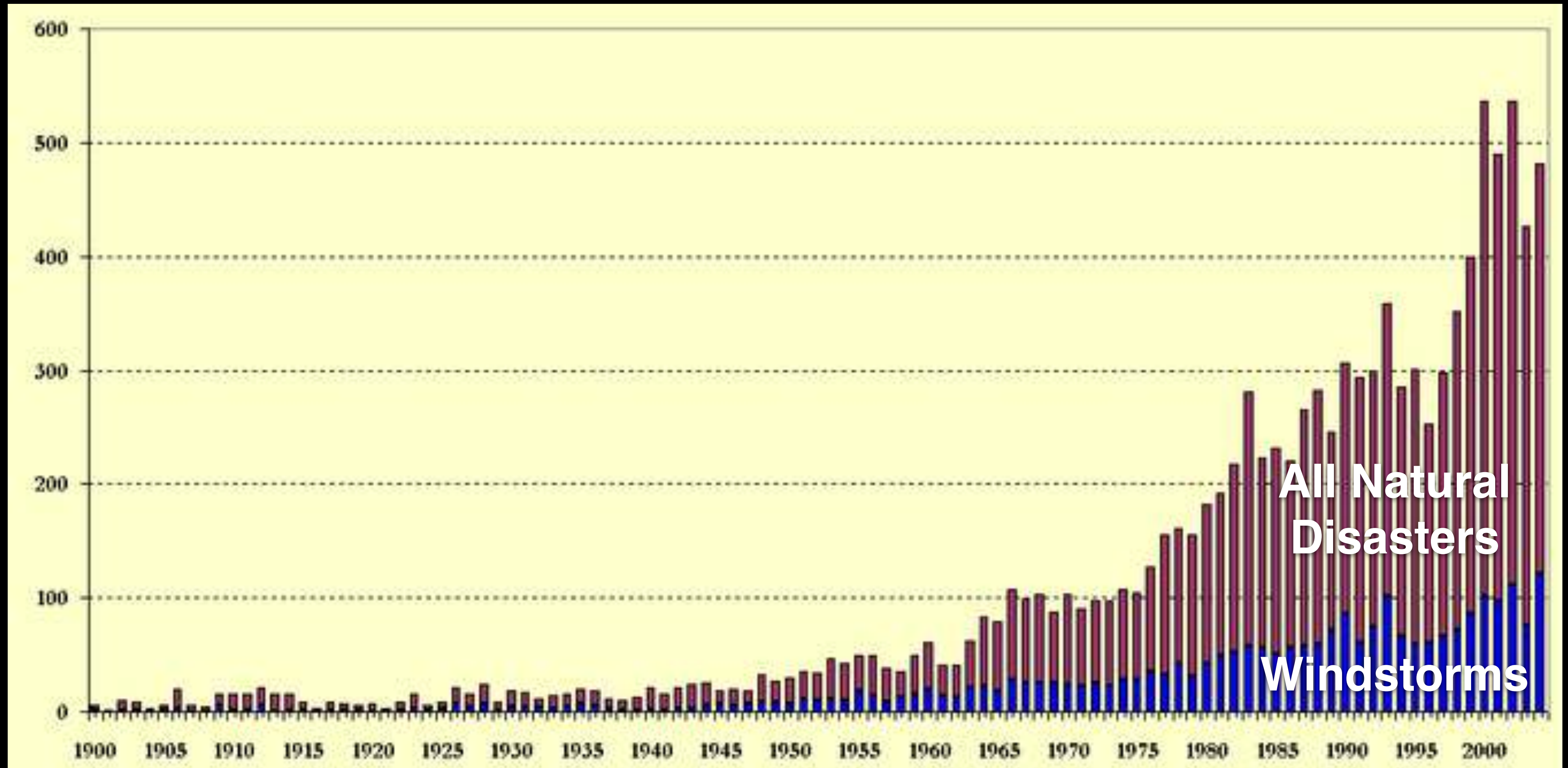
Outage Analysis: SAIDI (System Average Interruption Duration Index, in minutes)

This is a record of outages, from 1970 to present. We use SAIDI to measure how many minutes of each type of outage occur each year. Note the major outages that occurred in 1989 and 1990.

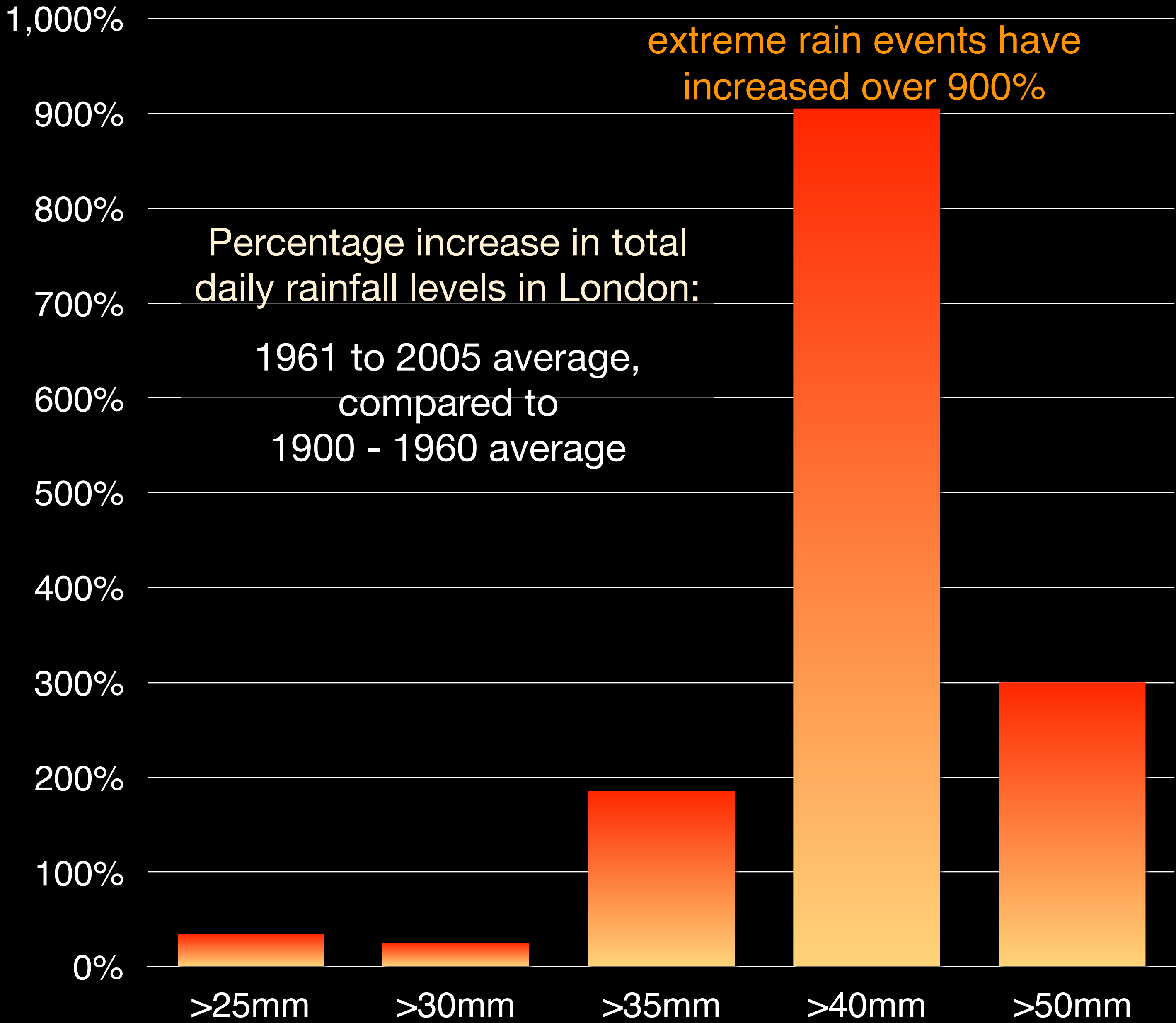
Recent major outages have mostly been due to mainland cuts, or tree strikes on Shaw Island.



Worldwide, there have been four times as many weather-related disasters in the past 30 years than in the previous 75 years.



Increasing Extreme Weather Events will Drive Outages

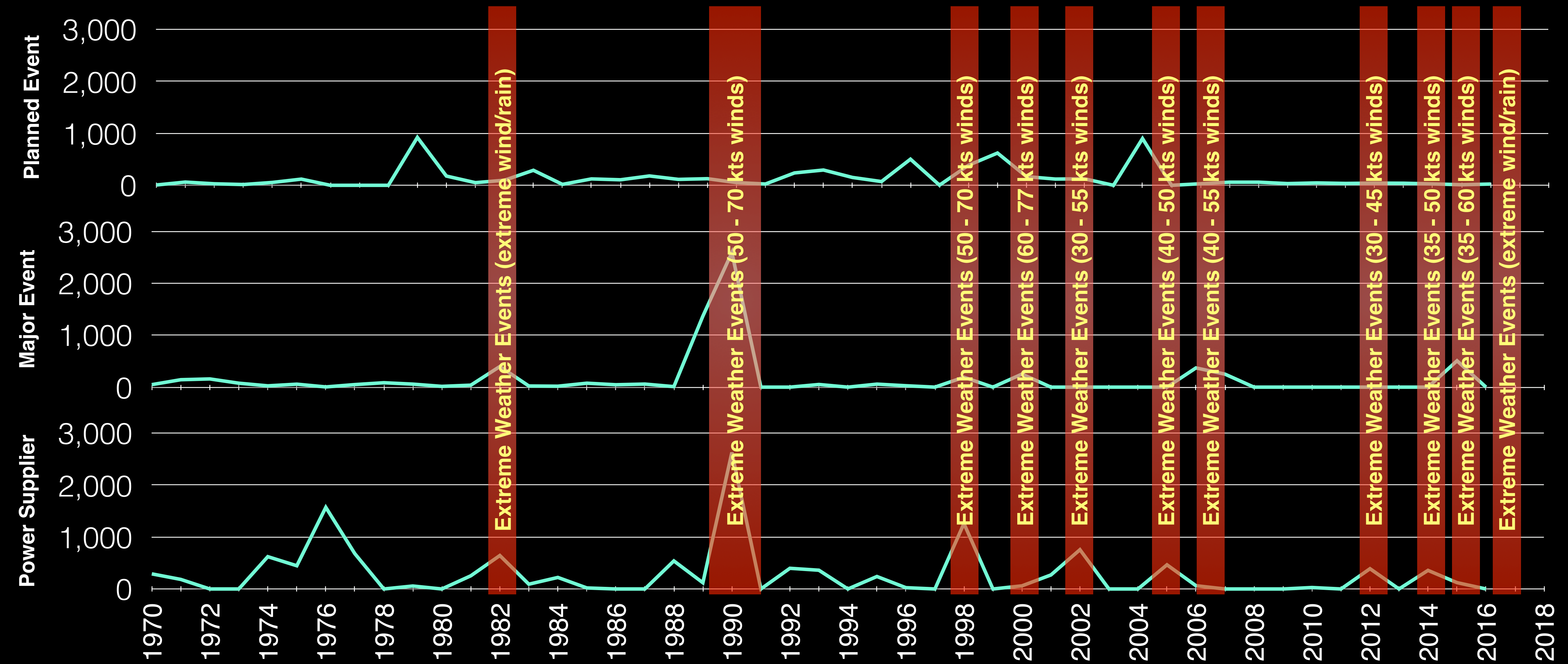


UW Climate Impacts Group

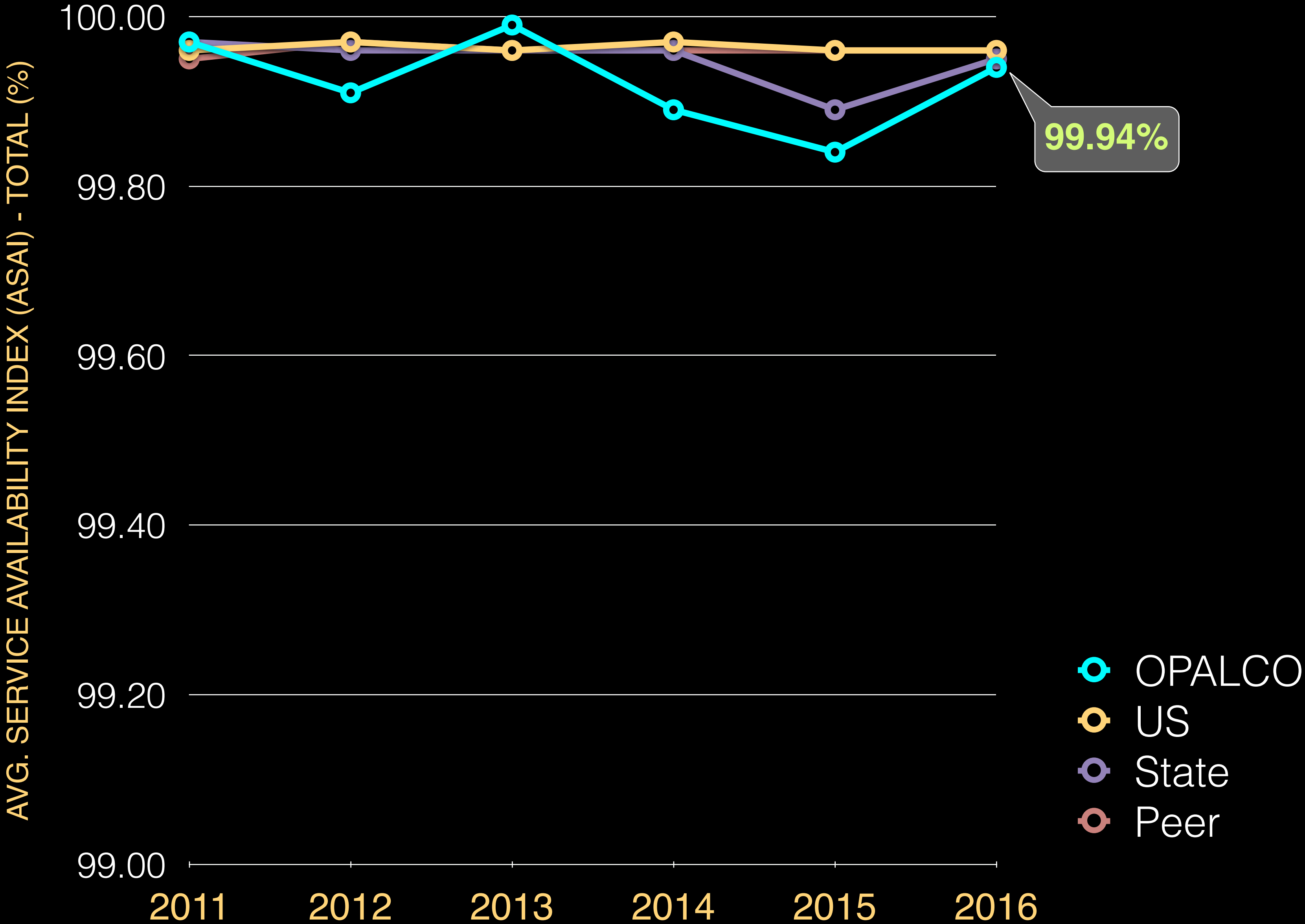
Energy systems that serve the region's population will face an increasing risk of a variety of *extreme weather events* (e.g., heat waves, wind, flooding, wildfire). Consequences include flooding of low-lying infrastructure, *damage to energy transmission*, and higher maintenance costs...

Outage Analysis: SAIDI (System Average Interruption Duration Index, in minutes)

We overlay extreme weather events that caused major outages. Note, storm related data is sketchy before 1990. With heightened awareness of climate disruption, storm data is much better since 2000.



KRTA Comparables: Reliable (KRTA #145)



Notes

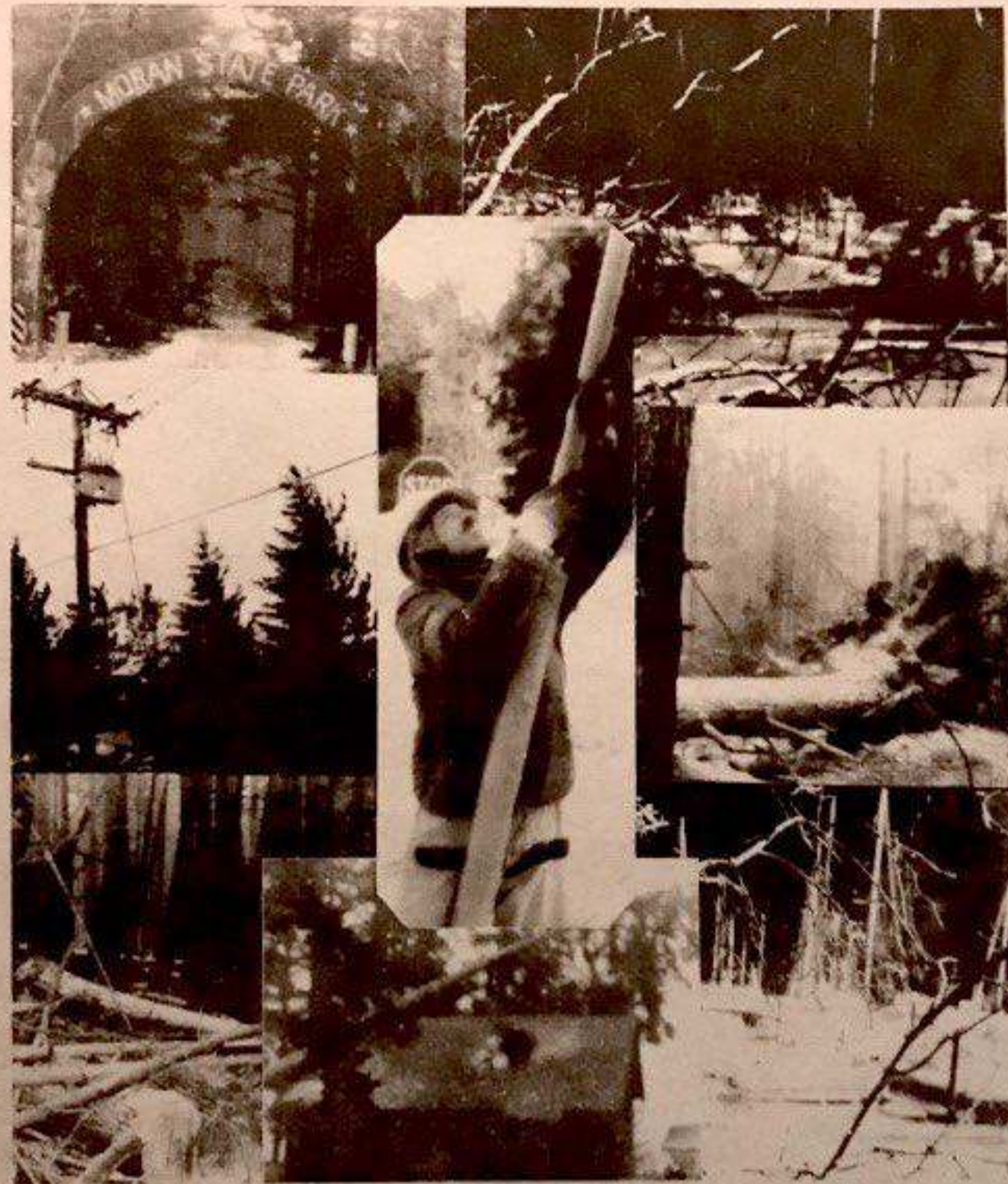
- OPALCO kept the power on 99.92% of the time in the last 6 years
- 2015 outage - work on underground circuits requires a planned outage – cannot work while “hot” and major outage on Shaw Island due to tree strike.
- Source notes: US median, WA median, Size median (similar to OPALCO total members)

Outage Analysis: SAIDI (System Average Interruption Duration Index, in minutes)



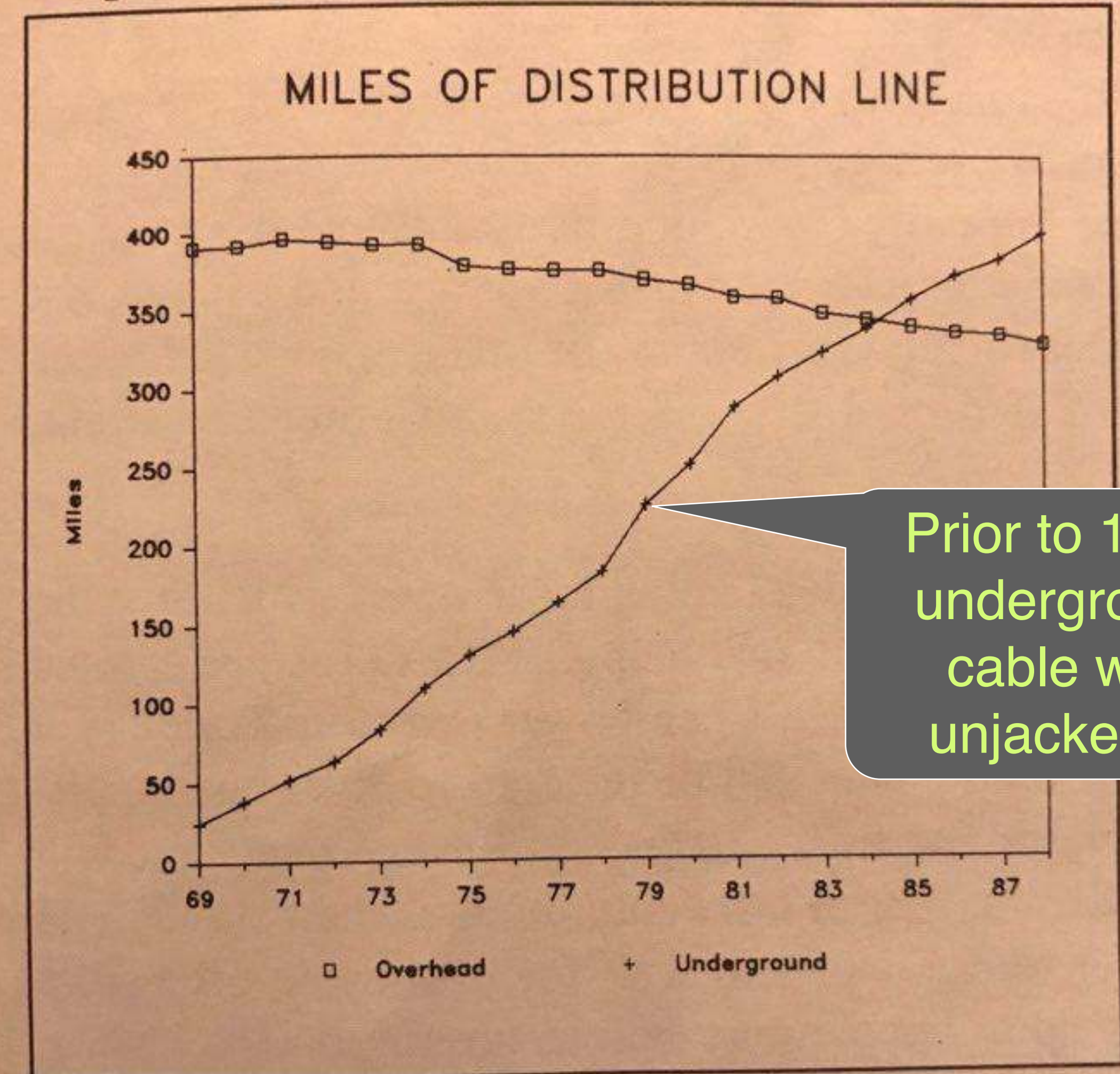
Northeaster '89 Extreme Weather Event of the 20th Century

NORTHEASTER '89



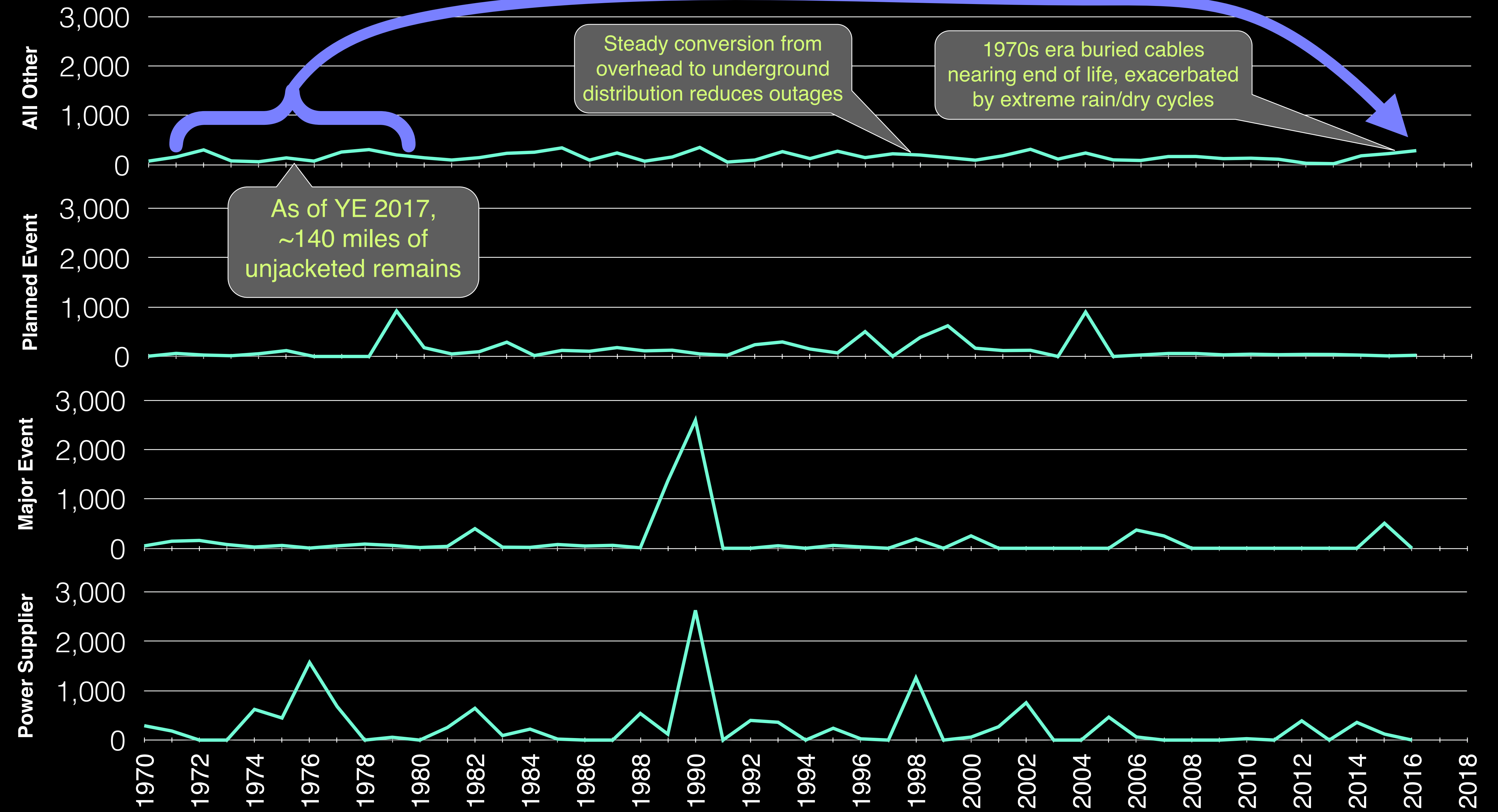
A Special Report
to the Members of
ORCAS POWER AND LIGHT COMPANY

underground. This graph shows the dramatic increase in the amount of underground lines over the past 20 years.



Prior to 1979,
underground
cable was
unjacketed.

Outage Analysis: SAIDI (System Average Interruption Duration Index, in minutes)



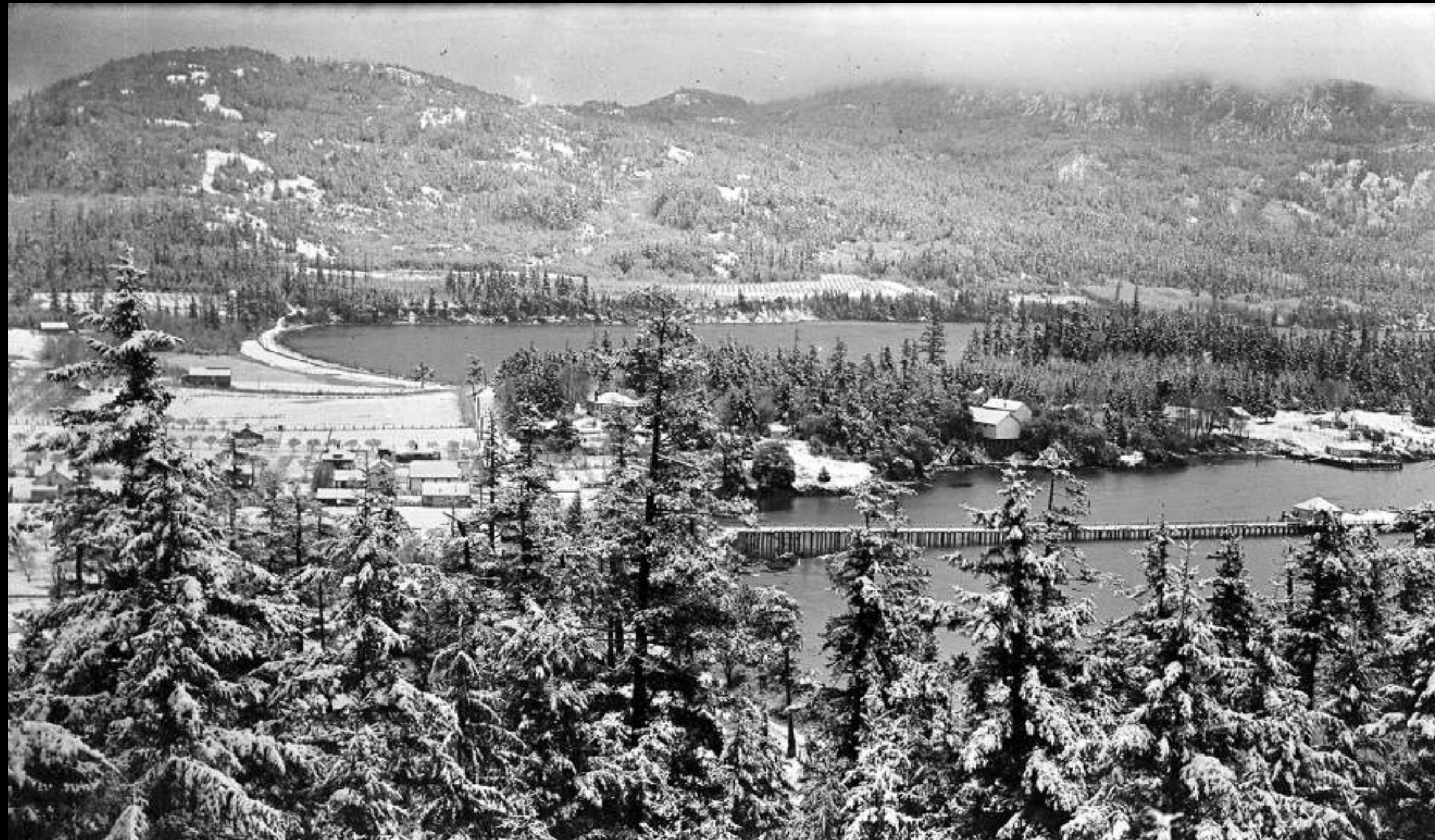
Shaw Trees Pose A Special Challenge

Starting in the late 1800's, through 1930, San Juan County was the nexus for lime production for burgeoning development along the west coast and Asia - construction, paper mills, metallurgy, and agriculture. Lime production centered on San Juan and Orcas Islands. Dozens of kilns, each consuming 3 to 4 cords of wood per day, operated for decades. The trees on these islands are therefore younger, posing less of a threat to transmission lines compared to the older, taller, aging trees on Shaw Island.



Shaw Trees Pose A Special Challenge

Starting in the late 1800's, through 1930, San Juan County was the nexus for lime production for burgeoning development along the west coast and Asia - construction, paper mills, metallurgy, and agriculture. Lime production centered on San Juan and Orcas Islands. Dozens of kilns, each consuming 3 to 4 cords of wood per day, operated for decades. The trees on these islands are therefore younger, posing less of a threat to transmission lines compared to the older, taller, aging trees on Shaw Island.



Shaw Trees Pose A Special Challenge



Mitigations

69kV Tap

Forthcoming redundant feed to Orcas from Decatur lessens dependence on Shaw transmission feed. (see next slide)

Shaw Right of Way (ROW)

Our current transmission feed (69kV) ROW through Shaw used to be distribution voltage (25kV) and the narrow ROW was never widened when we upgraded the line to transmission voltage to feed Orcas's higher load.

69 kV Tap Adds New Path

Upgrading the Decatur Island Substation in 2018 will allow a new transmission path on Orcas Island - increasing reliability.

Initially it will support the eastern half of Orcas. As grid modernization proceeds, more and more of the western half will be supported too.



Thank You