

FERC Technical Conference:

Climate Change, Extreme Weather & Electric System
Reliability. June 1-2, 2021
R. Clayton's Notes on Conference

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Agenda

- Introduction – More Frequent & Expensive Extreme Weather Effects
- Panel 1 – Planning for a Future that Diverges from Historical Trends
- Panel 2 – Best Practices for Long-Term Planning: Assessing & Mitigating the Risk of Climate Change & Extreme Weather Events
- Panel 3 – Operating Practices for Addressing Climate Change & Extreme Weather
- Panel 4 – Recovery & Restoration
- Panel 5 - Coordination

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More Frequent & Expensive Extreme Weather Effects

For interactive data, charts, mapping and disaster summaries:

www.ncdc.noaa.gov/billions

New annual report: 2020 U.S. billion-dollar weather and climate disasters in historical context

www.climate.gov/disasters2020



Adam.Smith@noaa.gov

For more detail on data, methodology and uncertainty, see:

- Smith A.B. and J.M. Matthews, 2015: Quantifying Uncertainty and Variable Sensitivity within the U.S. Billion-dollar Weather and Climate Disaster Cost Estimates. *Natural Hazards*, 77, 1829-1851 (<https://www.ncdc.noaa.gov/billions/docs/smith-and-matthews-2015.pdf>)

- Smith, A.B. and R.W. Katz, 2013: U.S. Billion-dollar weather and climate disasters: Data sources, trends, accuracy and biases. *Natural Hazards*, 67, 387-410 (<https://www.ncdc.noaa.gov/billions/docs/smith-and-katz-2013.pdf>)

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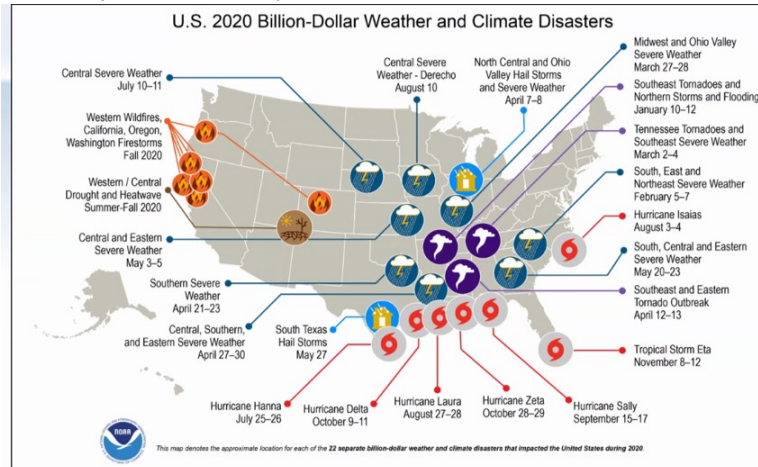
U.S. Billion-dollar Weather and Climate Disasters – 2020 in Context
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More Frequent & Expensive Extreme Weather Effects



During 2020, the U.S. experienced 22 separate billion-dollar disaster events with impacts from hurricanes, severe storms (i.e., tornadoes, hail and/or high wind), drought and wildfires. Total current cost for 2020 events: **\$96.4 billion**

Record-breaking hurricane & wildfire seasons. Central derecho event also of historic intensity and damage

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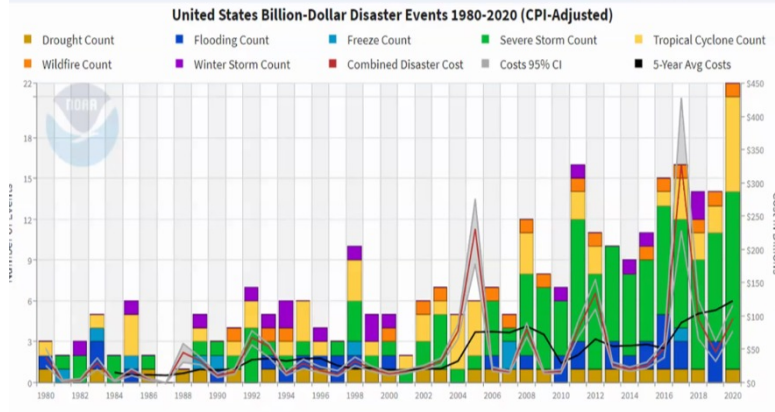
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More Frequent & Expensive Extreme Weather Effects

U.S. Billion-dollar event frequency, annual cost, 5-year cost average (1980–2020)



6th consecutive year (2015-2020) with 10 or more separate billion-dollar events.
5-year annual cost average > \$120.0 billion - a record; costs over 5 years (2016-2020) >\$600 billion - a record

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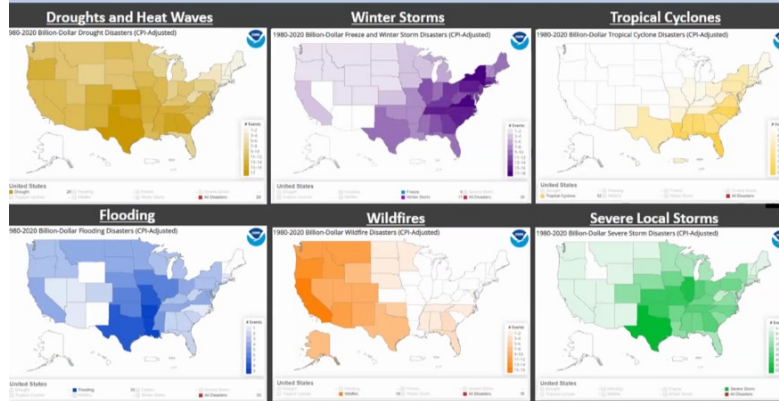
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More Frequent & Expensive Extreme Weather Effects

The Nation is weather and climate conscious...for good reason,
 as each geographic region faces unique hazards

Billion-dollar weather and climate disasters frequency mapping: 1980-2020



Please note that the map reflects a summation of billion-dollar events for each state affected (i.e., it does not mean that each state shown suffered at least \$1 billion in losses for each event).

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Panel 1 – Planning for a Future that Diverges from Historical Trends

- Adaptive capacity (resilience) to handle change
- Cannot rely on historical trends
- Importance of interregional coordination & ties
- Apply risk tolerance criteria
- Need for granular (local) weather data & consistent methodology
- Resource adequacy methodology needs to change
 - Whole year analysis
 - Incorporate climate trends (do not rely on historical trends)
 - Scenario risk analysis

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Panel 1 – Planning for a Future that Diverges from Historical Trends

- Consistency of data & analysis
- EW resiliency vs cost
- Micro-grids may be a solution
- 1 in 10 criterion is not an appropriate criterion for EW analysis (need frequency & duration of outage)

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Panel 2 – Best Practices for Long-Term Planning: Assessing & Mitigating the Risk of Climate Change & Extreme Weather Events

- Demand response is a valid option to meet resiliency requirements
- Resource adequacy criteria & analytical method
 - 1 in 10 criterion outmoded (generator centric)
 - Ignores demand response
 - Concentrates on capacity not energy
 - Customer discrimination (risk tolerance)
 - Method should include EW scenario analysis (like extreme contingencies)
 - Ignores common mode failures (e.g. gas & electric)
 - Extreme cold associated with wide spread low wind (no interregional support)
- National transmission planning authority

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Panel 3 – Operating Practices for Addressing Climate Change & Extreme Weather

- Market structures & rules
 - Carbon pricing
 - Extreme cold is NYCA concern
 - EW are low frequency events and should be handled by shortage pricing
- Demand response
 - Mitigation of EW events
 - Nano grid controllable
 - Virtual power station
 - Flexible energy
 - Prioritization of load type (risk tolerance)

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Panel 4 – Recovery & Restoration

- **Best practices**
 - Harden & raise substations
 - Mutual aid resources
 - Update SCADA & protection systems
 - Update communications
 - Importance of interregional ties

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Panel 5 - Coordination

- **Coordination between regulatory organizations emphasized**

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