



ASSOCIATION OF
METROPOLITAN
WATER AGENCIES

Black Sky

Not If, but When.

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Black Sky Event

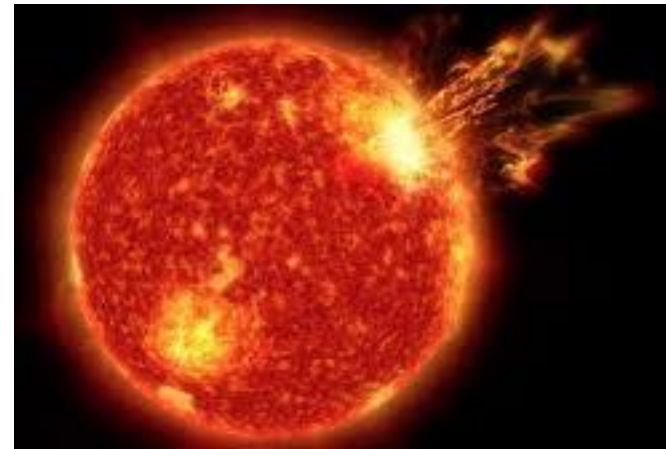
- Power outage across a large region
- 90% of customers without power
- Lasts a month or more



Black Sky Hazards

Natural:

- Massive solar storms
- Large-scale earthquakes
- Extreme terrestrial storms



Black Sky Hazards

Malicious

- Cyber attacks
- Coordinated cyber-physical attack
- High-altitude electromagnetic pulse



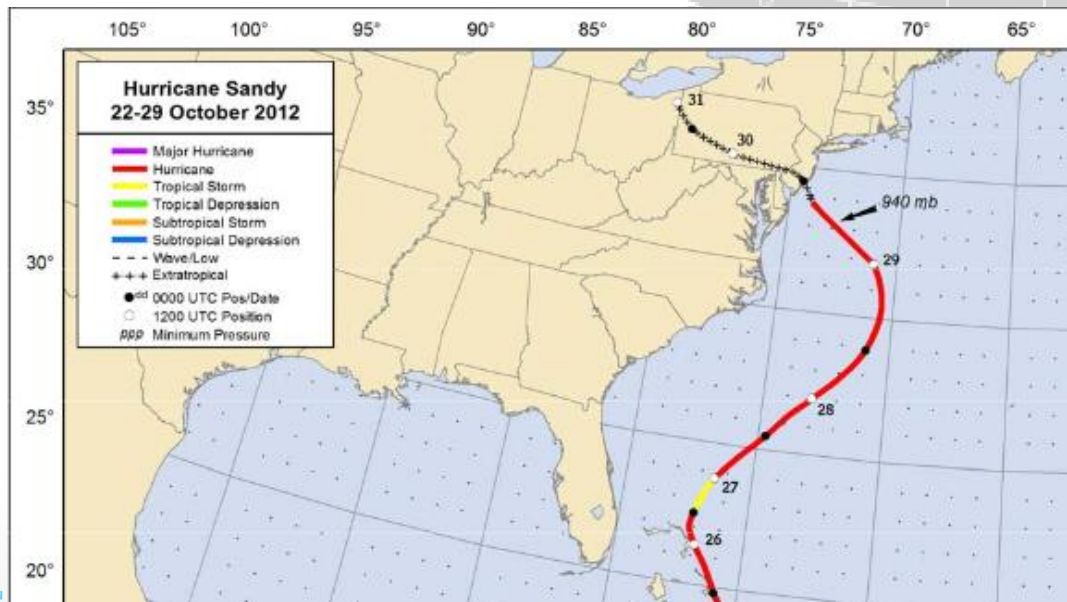
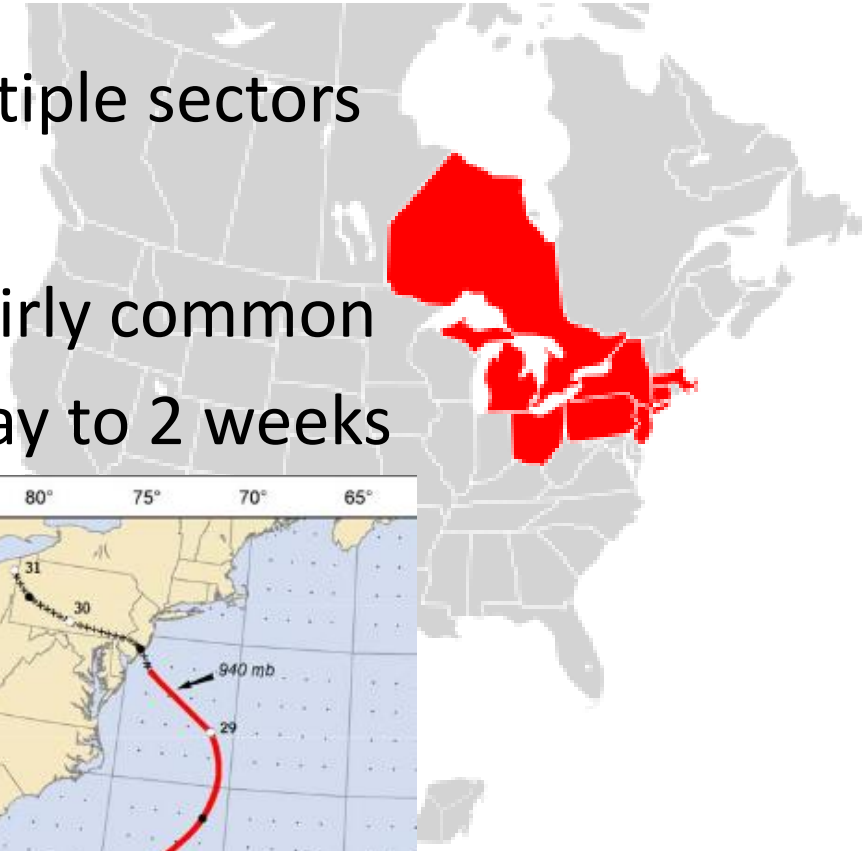
Likelihood?

- Severe storms? Yes
- Earthquakes? Eventually
- Cyber attack? Possible
- Electromagnetic pulse? *It could happen*



Impact & Restoration

- Black Sky hazards: multiple sectors
- Cascading failures
- Short-term outages: fairly common
- Restoration within 1 day to 2 weeks



Short-Duration Power Outages

- Most water systems can cope
- Storage
- Generators



Assuming...

- Working generators
- Enough generators
- Fuel availability
- Treatment chemical availability
- Personnel

But Under a Black Sky...

- Generators break, burn out
- Fuel is depleted
- Chemicals depleted
- Personnel don't return to work

Worse:

- Competition for generators
- Competition for generator operators, repair
- Security of staff, generators and fuel

Crisis

- Plants and pumps shut down
- Pressure is lost
 - Contamination, pipe breakage
- Firefighting difficult
- Sanitation challenges

The Result

- Mass evacuations
 - Chaos, loss of life
- National defense and security implications



What to do?

- Increase resiliency
- Operate for longer periods on back-up power
- *But for 30 days?*

Alternative: Service Reductions

- Reduce pressure and/or quality
- Avoid mass evacuations
- Fugate: “Keep the water on.”

Scenario A

- Reduce water service to selected zones
- Some districts will have potable water and others will not
- Inevitable in systems that are not gravity fed
- Political decision

Scenario B

- Reduce quality
 - Not safe to drink
 - “Self-treated” water
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- ✓ Firefighting
 - ✓ Wastewater effluent flows
 - ✓ Avoid contamination
 - ✓ Avoid pipe breakage
 - ✓ Cooling systems



Scenario C

- Reduce both quality and pressure
 - ✓ Firefighting
 - ✓ Wastewater flow



Plan for the Worst

- Fugate: “Hoping to scale up in middle of a crisis is a trap.”
- Some Black Sky hazards seem far fetched
- Others are a near certainty