

“Electric Reliability and Energy Security in Pennsylvania”

Presentation to the PA PUC Safety Seminar



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Disclaimer

- My presentation and opinions expressed do not necessarily represent those of the Commission, or any of the Commissioners

PUC and Electric Reliability

- The Electricity Generation Customer Choice and Competition Act mandated the Pennsylvania Public Utility Commission (PUC or Commission) to ensure levels of reliability that existed prior to the restructuring of the electric utility industry continue in the new competitive markets

PUC and Electric Reliability (Continued)

- The benchmarks and standards established by the Commission are based on the IEEE (Institute of Electrical and Electronics Engineers) metrics.
 - SAIFI: System average interruption frequency index or frequency of outages.
 - CAIDI: Customer average interruption duration index or duration of outages.
 - SAIDI: System average interruption duration index or frequency of sustained outages.
 - MAIFI: Momentary average interruption frequency index or occurrences of momentary customer interruptions.

PUC and Electric Reliability (Continued)

- Electric Distribution Companies (EDCs) report their metrics quarterly as rolling 12-month averages and every year as a 3-year calendar year average.
- The benchmark performance value represents the statistical average of the EDC's annual, system-wide, reliability performance index values for the five years from 1994-98. The benchmark value serves as an upper limit that EDCs should be consistently achieving to ensure reliability performance is considered satisfactory and acceptable.

PUC and Electric Reliability (Continued)

- The standard performance value represents an EDC's performance upper control limit established to allow EDCs to exceed the benchmark performance value occasionally and briefly.
- Both long-term (rolling 3-year) and short-term (rolling 12-month) performance standards have been established for each EDC based on individual EDC historical performance benchmarks.
- Exceeding the standard limit is an indication that the EDC's performance is not satisfactory.

PUC and Electric Reliability (Continued)

- The performance rolling 12-month average is 120% of the benchmark for the large EDCs (>100,000 customers) and 135% for the small EDCs.
- The performance rolling 3-year average is 110% of the benchmark for all EDCs.
- Reliability performance was poorer in 2021 than 2020.
- Only 5 EDCs made the SAIFI benchmark in 2021, as compared to 8 in 2020.

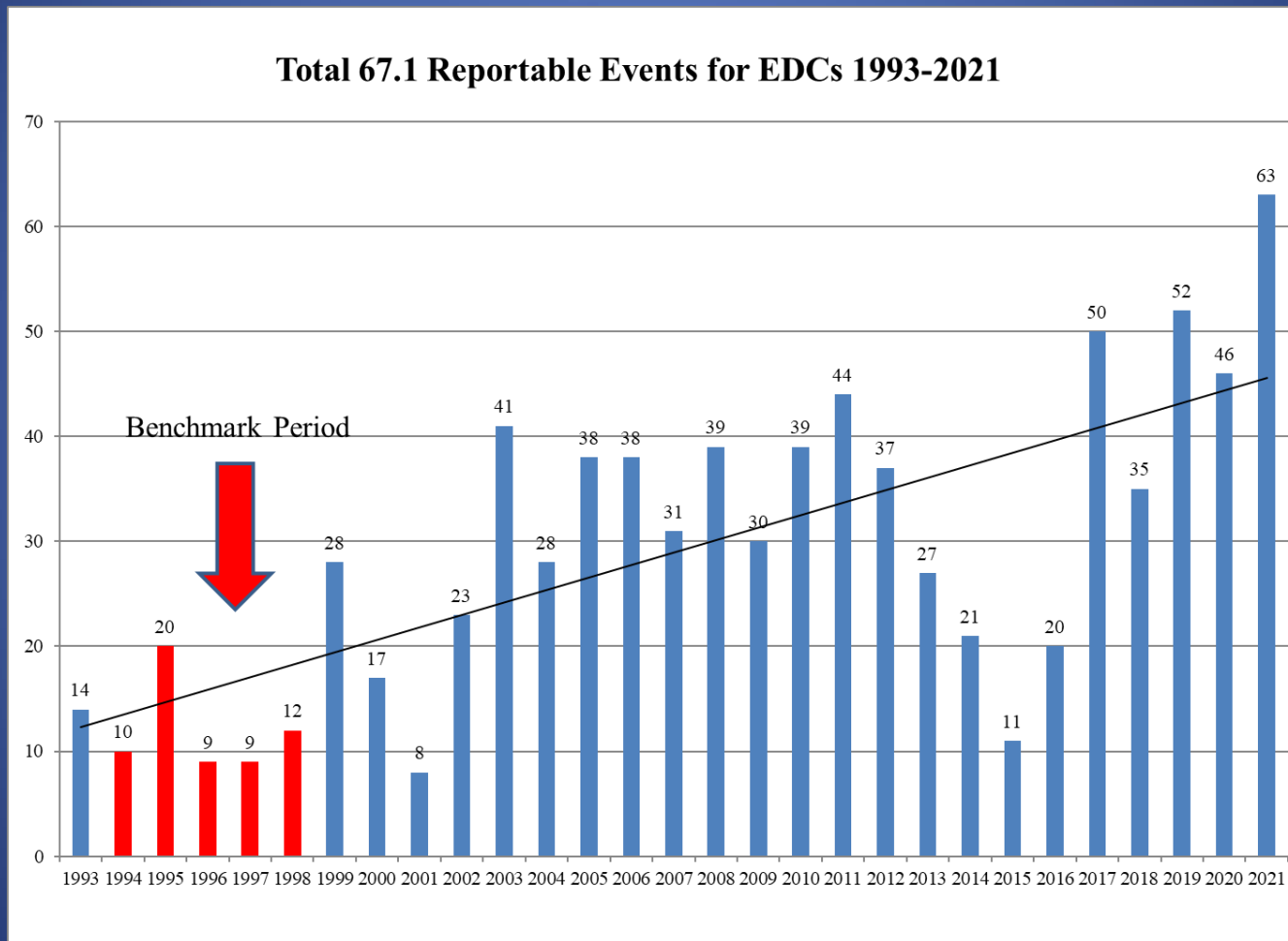
PUC and Electric Reliability (Continued)

- Only 3 EDCs met their SAIDI benchmark in 2021 as compared to 7 in 2020.
- Only 7 EDCs performed better than their 12-month SAIFI standard in 2021 as compared to 10 in 2020.
- Every EDC except one experienced higher customer outages and customer-minutes interrupted in 2021.
- In 2021, 36.4% of outage incidents were caused by vegetation (trees) and 22.4% by equipment failures.

Challenges to Electric Reliability in PA

- Weather is the primary factor driving electric outages – trees, trees off-right-of-way (OROW), high winds, heavy rain.
- Aging infrastructure also a factor (equipment failures).
- EDCs are experiencing increasing impacts from severe weather.
- EDCs have been reporting that they are experiencing more frequent, severe storms.

Challenges to Electric Reliability in PA (continued)



Challenges to Electric Reliability in PA

(continued)

- Aging infrastructure – all but 2 EDCs (2 of the smallest) have PUC-approved Long-Term Infrastructure Improvement Plans (LTIIPs)
- LTIIPs can be utilized to address aging infrastructure and resiliency – the ability to withstand and recover from weather events.

Future Challenges to Electric Reliability in PA

- Infrastructure improvements will need to continue.
- Climate Change:
 - Two important reports from the PA Department of Environmental Protection (DEP)
 - Pennsylvania Climate Impacts Assessment 2021
 - Pennsylvania Climate Action Plan 2021
 - <https://www.dep.pa.gov/Citizens/climate/Pages/default.aspx>
 - IPCC Reports: <https://www.ipcc.ch/>

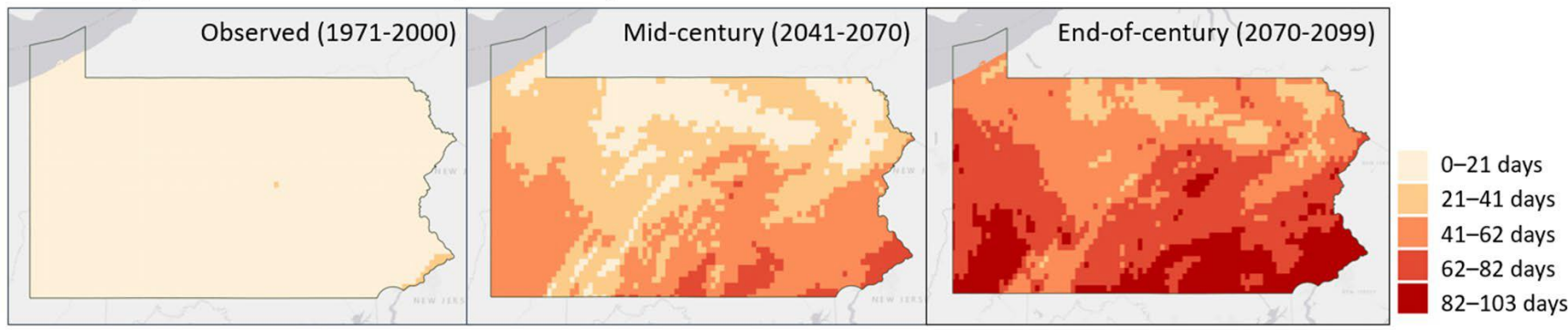
Future Challenges to Electric Reliability in

PA (continued)

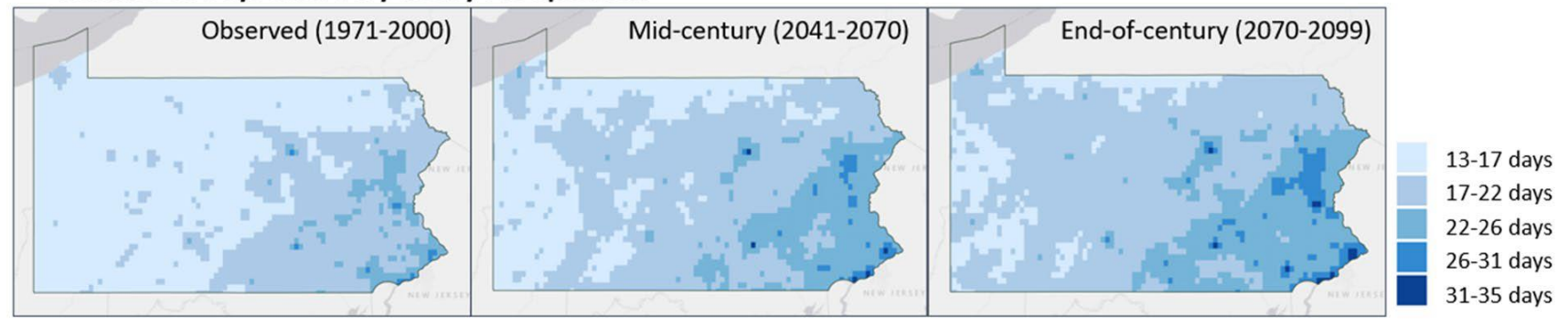
- DEP Climate Impacts Assessment
 - Expected changes (1971-2000 baseline) by mid-century include:
 - Avg temps increase by 5.9 degrees F.
 - More frequent and intense extreme heat events.
 - Changes to the growing season and heating/cooling seasons.
 - More rainfall in less frequent, but heavier rain events.

Future Challenges to Electric Reliability in PA (continued)

Average Annual Number of Days with Temperatures >90°F



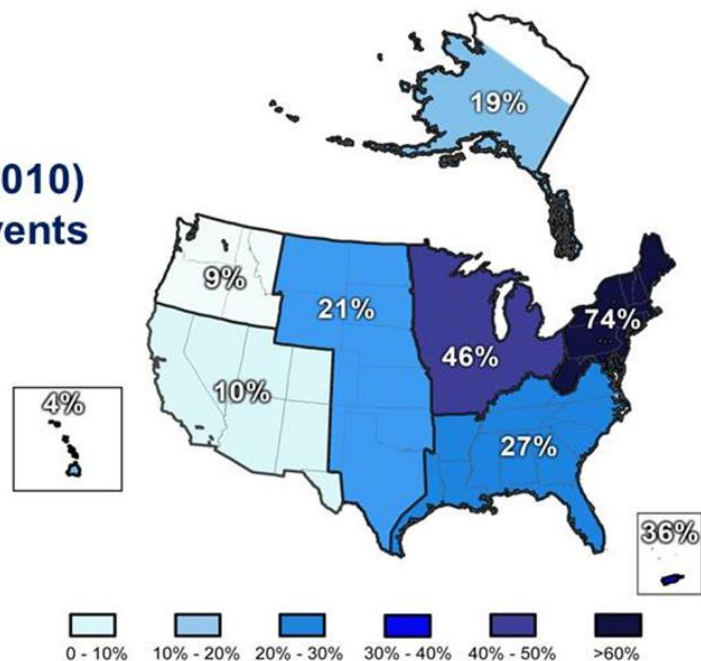
Number of Days with Very Heavy Precipitation



Future Challenges to Electric Reliability in PA (continued)

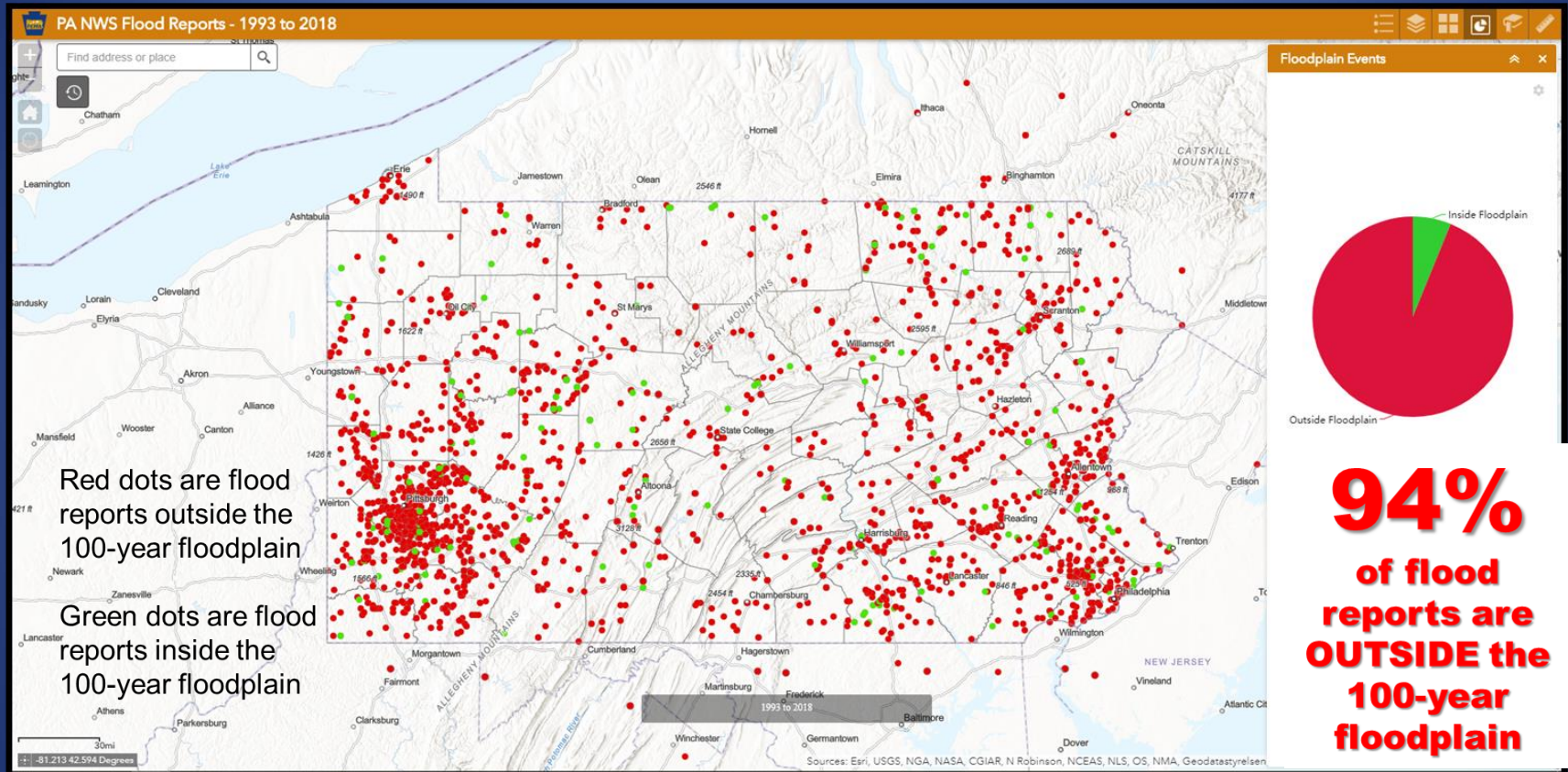
**Regardless of Shifts in Total Annual Rain
More of It Is Coming in Heavy Downpours**

**Percent Increase (1958-2010)
in Heavy Precipitation Events
(>2inch/48 hr)**



NOAA, provided by A. DeGaetano, NERCC, Cornell

Future Challenges to Electric Reliability in PA (continued)



Flood reports to the NWS from 1993-2018
Some locations may be approximate

Future Challenges to Electric Reliability in PA (continued)

- EDCs should incorporate climate and weather impacts into planning.
 - Increased heavy precipitation events and flooding
 - plan for flooding in areas that have not had historical issues with flooding.
 - Increased days of high heat – especially in the high population areas.
 - Increased issues with vegetation intrusion from OROW trees.

Future Challenges to Electric Reliability in PA (continued)

- Electrification challenges.
 - Increased usage of solar behind the meter.
 - Increased demand for electric vehicle (EV) charging.
 - Demand curves may be skewed – EV charging in the evening.
 - Voltage issues.

Energy Security Planning in PA

- The PUC is a support agency to 8 of the 15 Emergency Support Functions (ESFs) in the Commonwealth Emergency Operations Plan (CEOP).
- PUC is also a support agency to the Department of Environmental Protection (DEP) and supports the PA Energy Assurance Plan (EAP) – may soon be renamed the Energy Security Plan (ESP).
- DEP is updating the EAP into the PA ESP with support from the Department of Energy.

Energy Security Planning in PA (continued)

- The PUC's primary mission in the CEOP is support of ESF-12 – Energy.
 - Situational awareness of electrical outages.
 - Situational awareness of bulk electric grid issues.
 - Working with EDCs and state agencies on priority restoration issues.

Energy Security Planning in PA (continued)

- The ESP will address the energy security issues impacting PA.
 - Energy is more than just electric – natural gas, liquid fuels, biofuels, etc.
- The purpose of the ESP is to ensure PA is aware of and planning for energy emergencies.
- The ESP does not replace what the PUC already does with EDCs on emergency planning and emergency response.

Energy Security Planning in PA (continued)

- EDCs may be asked to participate in future testing/exercises related to the ESP.
- ESP factors in impacts to all energy infrastructure in PA.

Energy Security Planning in PA (continued)

- Black Sky Events (BSEs) – BSEs are defined as extraordinary events that produce power outages of a large, potentially regional scale, that last significantly longer than typical outages and may have cascading impacts on other critical infrastructure sectors.
 - An electromagnetic pulse (EMP).
 - Solar flares (GMD).
 - Cyber and/or physical attack.
 - Extreme weather.

Energy Security Planning in PA (continued)

- BSE Initiative.
 - PUC working with PEMA, Governor's Office of Homeland Security (GoHS), Utility Industry, and other state and federal stakeholders – aided by EIS Council.
 - June 2016 Tabletop Discussion – kicked off by Governor Wolf.
- Black Sky Steering Committee (BSSC)
 - Multi-agency and industry stakeholder effort.
 - Lifeline sectors: Energy, Water/WW, Communications, Transportation.

Energy Security Planning in PA (continued)

- BSSC Continues to meet twice a year.
 - Lifeline sector tabletops.
 - Identified critical interdependencies.
 - Communications – emergency communications.
 - Liquid fuels – criticality and availability.
 - Next meeting to work on a baseline communication process and how to PACE the process.
 - PACE – primary, alternate, contingency, emergency.

Energy Security Risks in Pa and EDCs

- Weather – always had an impact on EDCs.
- Physical Threats.
 - Vandalism and theft.
 - Unmanned Aerial Vehicles (UAVs or drones).
 - Homegrown violent extremists (HVEs).
 - Report events locally first, then to state and federal authorities.
 - Local law enforcement is critical to addressing active incidents. In some instances that is the State Police.
 - DHS, FBI, CISA, DOE, while important, are not first responders.
 - Key is the local law enforcement relationship.

Energy Security Risks in Pa and EDCs

- Cyber threats.
 - Ever increasing threat vector.
 - Operational staff and management should understand how a cyber event will impact their operations.
 - Cyber exercises should have IT and OT interplay.
 - Understanding how loss of IT and OT systems will impact operations and how to run “analog” if need be.

Commission Efforts

- Black Sky Steering Committee
- Cybersecurity
 - <https://www.puc.pa.gov/electricity/cybersecurity/>
- Energy Security Planning
- Exercises
 - GridEx, EarthEx, State Weather Ex, PA Cyber Incident Annex Ex, PJM Emergency Exercises

Thank You

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