Electric Distribution Cooperatives' Planning Must Include Measuring and Improving Reliability

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Reliability – the quality of service that you're delivering to your consumers over time – is an ongoing concern of electric utilities. During the April 2023 Heartland Metering Conference in Kansas, I shared some ideas about outages measurement and strategies for mitigation and management.

But first, let's consider how reliability affects your members and how it could change your utility's focus in the coming years.

We talk a lot about the consumer impacts these days because we have decentralized commerce. Those white and brown delivery vehicles have replaced much of the traffic at shopping malls, and reliable electricity is the most important part of keeping the new marketplace flowing.

People are spending more time working from home. It used to be we could concentrate on providing reliability to commercial centers. Now the home office is just as economically important as the downtown business center used to be. Our customers' expectations are changing, especially for utilities experiencing growth from urban sprawl.

Every year outage events cost us tens of billions of dollars. Couple that with increasing demands for energy through, for example, growth in electric vehicles. Reliability is becoming a matter of increasing urgency.

Measurement

You can start by asking, "How many times do your members end up sitting in the dark?" It is helpful to have a common understanding of what exactly an "outage" and "outage duration" are. How exactly do we quantify reliability? The IEEE has developed the standard scales we used to make these comparisons.
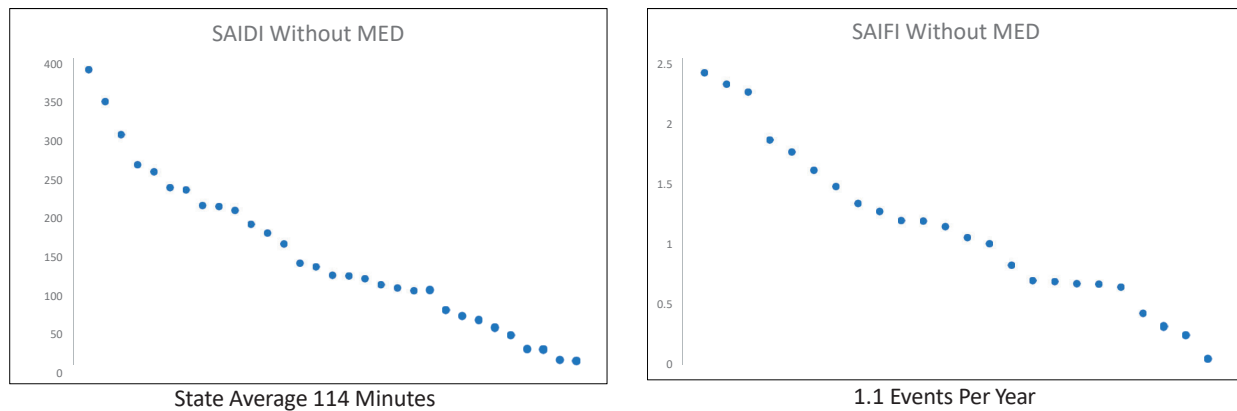
- SAIDI (System Average Interruption Duration Index) – the average annual total minutes of "non-momentary" outages a customer experiences.

- SAIFI (System Average Interruption Frequency Index) – the average annual total of "non-momentary" outages a customer experiences.

Pictured is my analysis of the state of Kansas during the years 2015-21, which I shared at the Heartland conference. On average, everyone in the state experiences somewhere between half an outage to 3.5 outages a year. The important factor to look at is "major event days" (MED) -- big ice storms in Minnesota, hurricanes on the gulf coast or some other significant weather event. We count MEDs separately because they are anomalies – an abnormal series of outages attributed due to significant events on specific days.

Kansas Reliability Metrics Major Event Day Included

SAIDI With MED

State Average 255 Minutes

SAIFI With MED

State Average 1.6 Events
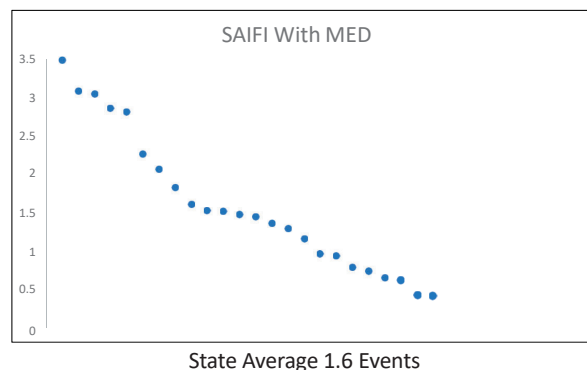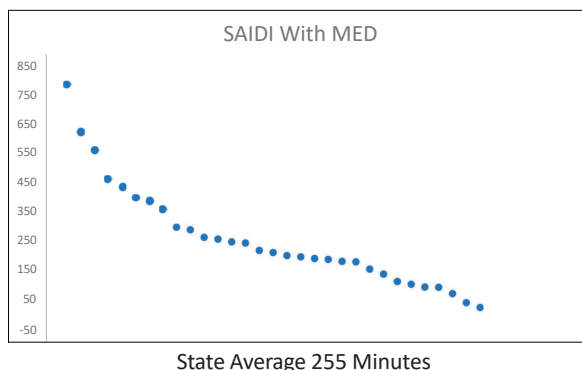
Kansas Reliability Metrics Major Event Day Excluded

SAIDI Without MED

State Average 114 Minutes

SAIFI Without MED

1.1 Events Per Year

The vertical axis in the SAIDI charts shows the range of minutes in outages and the x axis in the SAIFI shows the range of actual events. The scatter dots along horizontal access in each chart represents each individual electric cooperative in the state. A utility that has measured its SAIDI/SAIFI performance can compare itself against others in the state.
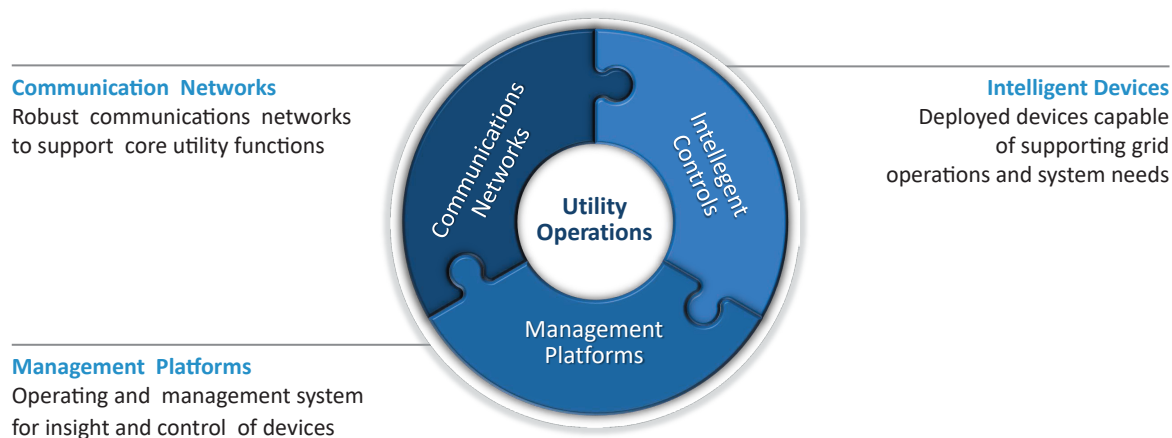
To put that in a national context, there is a high degree of SAIDI/SAIFI variability across the country based on several factors and each state has its own set of factors leading to outages.

Strategic Approaches

Areas with heavy vegetation or difficult, rocky terrains tend to pose reliability challenges and rural areas often fit the verdant, but rocky description. Urban areas with higher population densities tend to have more buried work facilities, which further lowers their SAIDI/SAIFI scores. The trade-off is that it sometimes it takes significantly longer to find and repair an outage to buried plant.

Which brings us to the benefits of approaching outages with a combination of risk mitigation strategy and systems to promote resilience.

Grid Management

Communication Networks
Robust communications networks to support core utility functions

Intelligent Devices
Deployed devices capable of supporting grid operations and system needs

Management Platforms
Operating and management system for insight and control of devices

Communications Networks

Intellegent Controls

Utility Operations

Management Platforms

There are several forms of risk mitigation you can take to increase reliability, such as automated monitoring systems and close vegetation management. But then after you've taken those steps, how well does your utility bounce back?

You might have automated outage reporting. You might have first-rate communications with crews in the field. You might start to automate some of the restoration process. You might have other resources available, such as utility scale energy storage capable of being dispatched as part of a community micro grid.

All these ideas create a higher level of resiliency and move operations back to a normal state more quickly.

When you are setting goals to improve your reliability, consider setting accompanying goals to improve your resiliency. The combined effects could be the way to make the most of your utility's technology investment.

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