

Overview of the TDEC Flicker Guide

Key Highlights

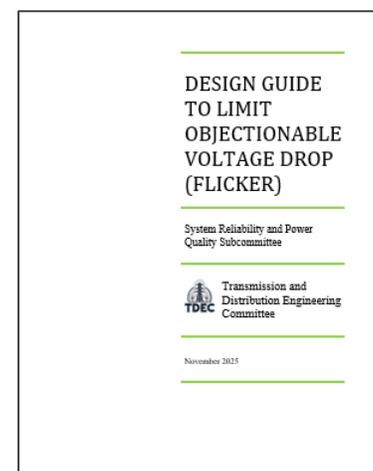
- The *Design Guide to Limit Objectionable Voltage Drop (Flicker)* was developed by the Transmission & Distribution Engineering Committee (TDEC) System Reliability and Power Quality Subcommittee.
- The Guide provides technical information for understanding, measuring and mitigating voltage fluctuations on the electric distribution systems to ensure power quality and customer satisfaction.
- This Advisory provides an Executive Summary of the Guide. The entire Guide can be found online on cooperative.com.

Executive Summary

The *Design Guide to Limit Objectionable Voltage Drop (Flicker)*, published by NRECA's Transmission and Distribution Engineering Committee's System Reliability and Power Quality Subcommittee, provides technical information for understanding, measuring and mitigating voltage fluctuations on the electric distribution systems to ensure power quality and customer satisfaction.

Voltage flicker — perceived as light flickering — caused by load fluctuations, particularly during motor startups and large equipment operation, poses significant operational and customer satisfaction challenges for electric utilities. Excessive flicker can lead to customer complaints, electronic equipment malfunctions, and potential damage to infrastructure. Managing these fluctuations is critical to maintaining power quality, ensuring reliable service, and avoiding costly operational disruptions.

This TDEC publication covers flicker standards, policy considerations, and common sources of electrical disturbances such as induction motors, air conditioning systems, and other potentially problematic loads. It also includes information on motor control and presents methods for calculating voltage levels and flicker effects during both startup and normal operation. The document emphasizes proactive assessment of voltage levels at the source and neighboring areas and installing or upgrading service facilities to prevent customer complaints, equipment malfunction, and system damage.



Key Points

- **Standards and Measurement:**

Flicker levels are assessed using standards such as IEEE Std. 141-1993 and IEC 61000-4-15:2010, which quantify flicker perception through metrics like Pst and Plt. These standards guide acceptable voltage fluctuation levels but require specialized measurement tools.

- **Impact of Load Characteristics:**

Motor size, starting current, and system impedance significantly influence voltage dips. Larger motors and longer distribution lines increase flicker severity. Unbalanced voltages and inadequate system design exacerbate the problem.

- **Operational Challenges:**

Without proper mitigation, flicker can cause equipment shutdowns, reduce system efficiency, and lead to customer dissatisfaction. Existing policies often lack clear thresholds or proactive measures for managing load-induced flicker.

- **Distributed Energy Resources:**

DER can pose risks to power quality on the electric distribution system. When distributed generation is interconnected with the distribution grid, the cooperative must evaluate equipment settings — such as regulators, capacitors, and protection schemes — to ensure there are no adverse impacts on the system.

Mitigation Strategies and Solutions

- **Pre-Installation Planning:**

Conduct detailed voltage dip calculations and system assessments before deploying large loads or distributed generation to prevent flicker issues.

- **Use of Mitigation Technologies:**

Implement soft-start devices, variable speed drives, and power quality equipment such as static VAR compensators (SVCs) and STATCOMs to reduce inrush currents and stabilize voltage levels during load changes.

- **System Design Improvements:**

Upgrade distribution feeders, increase conductor sizes, and optimize transformer configurations to minimize impedance and voltage drops.

- **Policy Development:**

Establish clear guidelines for maximum permissible starting currents, voltage dips, and flicker levels. Require customers to provide detailed load data and adhere to standards to ensure system compatibility.

- **Monitoring and Maintenance:**

Regularly measure system performance using specialized flicker meters and adjust operational practices accordingly.

Application Next Steps

1. Develop and implement comprehensive flicker management policies aligned with industry standards.
2. Invest in advanced measurement and mitigation equipment for ongoing system monitoring.
3. Train operational staff on load assessment, system design improvements, and the use of power quality solutions.
4. Engage with customers to educate on load management and encourage the use of equipment that minimizes flicker.
5. Schedule periodic reviews of system performance and update mitigation strategies as new loads and technologies are introduced.

Additional Resources

- [Full Report: *Design Guide to Limit Objectionable Voltage Drop \(Flicker\)*](#)
- [Transmission Distribution Engineering Committee](#)

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