



**IEEE PES Transformers Committee**  
**Fall 2020 Meeting**  
**Online/Virtual**



**Sound Level Specifications of Power Transformers for  
Compliance, Cost Effectiveness and Clarity**

**— Technical Presentation —**  
**Thursday, October 22, 2020**

**By Ramsis Girgis and Chris Howell**

**1. Abstract**

In most cases, noise levels included in power transformer specifications have a significant impact on the design and, consequently, the cost of the transformer. At the same time, transformer manufacturers have seen some specifications require unnecessarily low noise levels and, in some cases, unnecessarily require the use of costly sound panels or sound enclosures, which increase the cost of the transformer. On the other hand, some specifications allow higher noise levels than required by local noise ordinances or noise specifications that often result in complaints when these transformers are operating on-site.

This tutorial has two parts. In the first part, Dr. Ramsis Girgis will provide a short overview of transformer noise and how specified noise levels impact the design and cost of a transformer. He will also identify opportunities for improving deficiencies in existing transformer specifications related to transformer noise. In the second part, Mr. Chris Howell will provide information on methodologies used by substation design engineers to determine appropriate noise levels of transformers on-site to satisfy requirements of local and state noise ordinances.

**2. Learning Objectives**

This tutorial provides the following learning opportunities:

- Introduce the different components of transformer noise and their frequency characteristics that impact transformer sound propagation
- Show the impact of specified noise levels on the design and cost of the transformer
- Explain factors affecting sound propagation on-site
- Describe methodologies used by substation design personnel to calculate the impact of power transformer noise on the noise level at the boundary of the substation and residential areas
- Present examples of noise requirements of local and state noise ordinances
- Present examples of existing noise specifications and identify opportunities for improvements and elimination of deficiencies

### **3. Presenters' Biographies**

**Dr. Ramsis Girgis** (IEEE Life Fellow Member) is currently a leader on the global Hitachi-Power Grids Power Transformer Technology Development team. He has been an active member of the IEEE Transformers Standards Committee over the past four decades and is presently Chairman of the Audible Sound Revision to Test Code Task Force. Previously, he was Chairman of the Performance Characteristics Subcommittee. In the mid-1980s, Dr. Girgis represented the U.S. National Committee on the IEC Power Transformers Technical Committee 14 as a technical advisor. In 2013, Dr. Girgis received the IEEE Standards Medallion for Significant Contributions to the Transformer Industry and Transformer Standards. Ramsis received his PhD in Electrical Power Engineering from the University of Saskatchewan, Canada in 1978.

**Mr. Chris Howell** (Institute of Noise Control Engineering member) is a project manager in the Environmental Services Division at Burns & McDonnell Engineering Company. He manages general environmental permitting teams for generation, transmission and distribution projects as well as leading Burns & McDonnell's efforts on noise analyses. Chris' experienced team of technical specialists conduct feasibility studies and assist clients with regulatory compliance and/or mitigation efforts, many of which require public involvement and/or interaction with regulatory agencies. He received his Bachelor of Science Degree in Mechanical Engineering from Kansas State University in 1999.