

# Surge Protection for Critical Facilities: An End User Perspective for Power Quality

## Contact Person (sole presenter)

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As per predictions of the International Technology Roadmap for Semiconductors (ITRS) key characteristics of the modern gigahertz capability ICs and the high density semiconductors are that (i) feature size continue to fall towards 0.1 micron (ii) DC power supply requirement keeps dropping to sub 1V levels (iii) equivalent noise voltage levels are increasing towards DC supply values. Also about 75% of the generated electrical power is reprocessed today by various power converters. Delicate electronic hardware as well as the complex power electronic subsystems used as power conditioning systems are both prone to lightning and power transients through the power conversion interfaces. These could temporarily disturb systems or permanently destroy delicate hardware and/or the protection system itself, creating single event upsets (SEUs) as well as disastrous total service breakdowns. Current approach to safeguard against these problems is to buffer the systems by power conditioning systems and transient voltage surge suppressors (TVSS) or various transient isolation techniques to isolate common and differential mode surges.

The tutorial will discuss the surge protection concepts in an end user perspective with a summary of the following: (i) common and differential mode transients (ii) standards applicable to surge and transient protection in industrial environments including an overview of IEEE C62.41 series etc (iii) practical surge protection techniques applicable to low voltage systems (iii) practical devices inside the surge protection systems and their limitations (iv) three categories of TVS device protection (iv) new approaches in surge protection (v) practical guidelines to develop and specify a complete surge protection system

The tutorial presentation will be based on a balanced mix of applicable practices, standards applicable, available technologies and commercial practices and a summary of the state of the art, supported by a selected set of research publications. The tutorial will concentrate on the end user protection aspects and the necessary precautions to be observed by the end users.

## Presenter's background:

Former CEO of the Arthur C Clarke Institute for Modern Technologies (ACCIMT) in Sri Lanka, Nihal Kularatna is an electronics engineer with over 32 years of industrial and research experience. He is the author of two Electrical Measurement Series books for the IEE (London) titled "*Modern electronic test & measuring instruments*" (1996) and "*Digital and analogue instrumentation- testing and measurement*" (2003) and the two Butterworth(USA) titles "*Power electronics design handbook-low power components and applications*" (1998) and the "*Modern Component Families and Circuit Block Design*" (2000). He coauthored the

book “*Essentials of modern telecommunications systems*” for Artech House Publishers in USA (2004).

For ten years he worked as an electronics engineer responsible for navigational aids and communications projects in civil aviation and digital telephone exchange systems etc before joining the Arthur C Clarke Institute (ACCIMT) in 1985. He was a Principal research engineer at ACCIMT for 10 years before he was appointed the CEO in 2000. His long career in Sri Lanka, where lightning and power surges were at extreme, allowed him to work in the areas of power conditioning and surge protection with a commercial and industrial angle. Two of his books [Elsevier- Newnes (1998), CRC Press, (2008)] discuss the surge protection and power electronics design in several chapters.

From 2002 to 2005 he was a Senior Lecturer at the Department of Electrical and Computer Engineering, University of Auckland, New Zealand. He was a consultant for two US companies, including the Gartner Group, and was a senior consultant to many Sri Lankan companies. He is currently a Senior Lecturer at the School of Science and Engineering at the University of Waikato, New Zealand. He has contributed over 60 papers to many international conferences and journals. He is Fellow of the IET (London) and a Senior Member of IEEE.

His latest contribution will be the new CRC book titled “*Design of electronic circuits – from concept to implementation*” which is expected to be in print before IECON 08. He enjoys gardening cacti and succulents.

### **Intended Audience**

Participants are expected to have a basic or medium level experience and exposure to power electronics and industrial systems design. Following topics of conference will be related:

Power Electronics/ Electrical Drives & Machines/Factory Automation & Industrial Informatics

In addition, the following special session topics are related

New Challenges in Power Quality/ Advanced Active Power Line Conditioners/Topology and Control of Converters for LED Lighting Applications/ Application of Power Electronics in Renewable Energy/ Building Automation, Control and Management/