



**TRANSFORMERS MAGAZINE**

ISSN 1849-3319 (Print) ISSN 1849-7268 (Digital)

**EDITORIAL BOARD**

Editor-in-Chief:  
Mladen Banovic, PhD, Merit Services Int., Croatia  
mladen.banovic@transformers-magazine.com

**EXECUTIVE EDITORS**

Michel Duval, PhD, Hydro Quebec, Canada  
Jean Sanchez, PhD, Utility, France  
Jin Sim, Jin Sim & Associates, Inc., USA  
Juliano Montanha, SIEMENS, Brazil  
Craig Adams, TRAFIX, Australia  
Arne Petersen, AP Consulting, Australia  
Michael Krüger, OMICRON electronics GmbH, Austria  
Zhao Yongzhi, Shandong Electrical Engineering & Equipment Group Co., Ltd, China

Art Director: Momir Blazek  
Photo: Shutterstock.com

Front page: Cover image by Maschinenfabrik Reinhausen GmbH

Language Editor: Marina C. Williams

**ADVERTISING AND SUBSCRIPTION**

Marin A. Dugandzic  
+44 20 373 474 69  
marin.dugandzic@merit-media.com

**TRANSFORMERS MAGAZINE**

Transformers Magazine is published quarterly by Merit Media Int. d.o.o., Setaliste 150. brigade 10, 10 090 Zagreb, Croatia. Published articles don't represent official position of Merit Media Int. d.o.o. Merit Media Int. d.o.o. is not responsible for the content. The responsibility for articles rests upon the authors, and the responsibility for ads rests upon advertisers. Manuscripts, photos and other submitted documents are not returned.

**Subscription rates:**

Print edition: \$96 (1 year, 4 issues)  
Digital edition: \$54 (1 year, 4 issues)  
Online edition - full access: \$19 (1 year, 4 issues)  
Online edition - free access: free of charge for registered users  
www.transformers-magazine.com

**REPRINT**

Libraries are permitted to photocopy for the private use of patrons. Abstracting is permitted with credit to the source. A per-copy fee must be paid to the Publisher, contact Subscription. For other copying or republication permissions, contact Subscription. All rights reserved.

Publisher: Merit Media Int. d.o.o.  
Setaliste 150. brigade 10,  
10 090 Zagreb, Croatia  
Contact: +385 1 7899 507  
Contact: +44 20 373 474 69 UK  
VAT number: HR09122628912  
www.transformers-magazine.com  
Bank name: Zagrebacka banka  
Bank identifier code: ZABHR2X  
Bank IBAN: HR8023600001102375121  
Director: Ana Jelcic

**Dear Readers,**

In the previous issue of Transformers Magazine, my message highlighted how the information on the technology and market trends that the magazine brings can help companies to stay updated and increase their ability to respond promptly to ever-changing requirements and conditions in the industry. Following this, I had discussions with people at some industry events who showed more interest in this, and held presentations on this matter. Considering the stirred interest, I would like to point to important aspects that emerged out of these discussions – one of which is the reliability of transformer operation.

I think there is some kind of a consensus that reliability is a number one requirement driving technology trends today, among other requirements such as extending asset lifetime, reducing operational costs and reducing the impact on the environment. For some applications there are equally important requirements that concern overloading capability, reduction of size/weight, enabling infeed of renewable energy, etc.

Coming back to reliability, let me quote a statement that was recently published in our magazine: "Every day across the United States, half a million people on

average are impacted by power outages, which carry an estimated annual cost of at least \$150 billion and rising."

Taking into account that these figures refer to the U.S. only, we can only imagine what the global figures are. That being so, blackouts are the nightmare of today's energy industry, no matter where in the world utilities operate. Therefore, solutions which help increase reliability, i.e. help avoid failures or decrease the impact of failures on the society are precious. I would like to point out some of them, such as the solutions for prevention of transformer explosion which are available for power transformers and are expected to be available for distribution transformers in the near future; a shift to ester liquids due to the fire safety they provide; online monitoring, etc. There are many other solutions that we have published about.

What is important here is that these solutions have to be reliable enough so as not to reduce transformer reliability. I recall a discussion at a conference last year, when we, for the sake of argument, discussed how far the applicability of online DGA systems can go. This brought up a question if it would be useful to have some kind of a micro DGA system for installation on bushings. It