



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
Michael Krüger, PhD, OMICRON electronics, Austria
Jin Sim, Jin Sim & Associates, Inc., USA
Juliano Montanha, SIEMENS, Brazil
Craig Adams, TRAFIX, Australia
Arne Petersen, Consulting engineer, Australia
Zhao Yongzhi, Shandong Electrical Engineering & Equipment Group Co., Ltd, China
Barry M. Mirzaei, LargePowerTransformers Inc., Canada
Daosheng Liu, Jiangxi University of Science and Technology, China
Mislav Trbusic, University of Maribor, Slovenia

ASSISTANT EDITOR

Pedro Henrique Aquino Barra, MSc,
EESC/USP – University of São Paulo, Brazil

Art Director: Momir Blazek
Language Editor: Mirna Maric
Photo: Shutterstock.com
Front cover photo: Siemens

ADVERTISING AND SUBSCRIPTION

Ante Prlic
+44 20 373 474 69
ante.prlic@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: \$115 (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: HRO9122628912
www.transformers-magazine.com
Bank name: Zagrebacka banka
Bank identifier code: ZABAHR2X
Bank IBAN: HR802360001102375121
Director: Ana Jelcic

Dear Readers,

You are holding in front of you our Special Edition on Substations. This topic is the result of our readers' choice and I think this is a good opportunity for all of us dealing with specific products, to look at the big picture and the conditions in which these products are made – substations.

This issue confirmed once again that digitalization is the dominant trend which enables new opportunities and imposes new challenges for power products. The first conclusion would be that monitoring as we know it, will slowly cease to satisfy practical needs. Power products must be, starting for their design, increasingly able to communicate with other devices and systems in the power grid which comprise the Internet of Things (IoT). The great number of such devices in the network generates big amounts of data and that data needs to be transferred, processed, and stored safely. Cybersecurity comes out of the security standpoint, and, operationally, Big Data arises. The interview with Goran Leci dwells more on the topic of cybersecurity of the critical infrastructure.

At the recently held EuroDoble conference in Porto, Portugal, one of the key topics and one of the panel discussion topic was the Big Data. There are a number of definitions of the Big Data, and my interpretation, influenced by several definitions that I have heard during presentations and discussions, is that the Big Data is the big collection of data that is not easy to process and store in the usual ways and by using the already existing software and hardware.

To illustrate the Big Data challenge awaiting as all, the example from one discussion will be used. One TSO has around 1000 power transformers in its fleet. The practice this TSO follows for the power transformers that do not show any signs of distress is to take the first DGA sample after 25 years of transformers use. Considering the power transformers' life span and the dynamics of the DGA sampling, they have around 300,000 DGA samples in their database. When an online

DGA system is installed on the power transformer, which on average gives 4 DGA samples a day, after 25 years that power transformer will have 36,500 DGA results in the database instead of one. Although the ratio of increased DGA data number will probably not be 36,500 in real life situation, this is still not the extreme situation. If we consider partial discharge monitoring, which can generate a GB of data just in a couple of seconds, we can imagine what Big Data means. The preparation to undertake such huge data influx is on one hand challenging, and on the other that much data opens up the possibilities for learning and applying the AI method and machine learning like we have never seen before.

The design of intelligent products is not only the vision for the future since such solutions described in this issue are already used in practice

One of the solutions which should be of great help with all those challenges is the design of the intelligent products, that is, equipping the power products with intelligent algorithms. It is important to say that this is not only a vision for future since such solutions described in this issue are already used in practice.

This issue brings you the new column on substation design by Paul Jarman. He writes about HV substations which are close to, within or even underneath places where people live and work, putting an emphasis on the safety and environmental compatibility in terms of materials, noise, and especially fire. Considering the author's vast experience in this area, I would highly recommend you to read this column.

In another interview, **Massimo Fioravanti** talks about the available green and smart solutions for oil processing that enable circular economy and reduce pollution.

Ufuk Kivrak, in his column, explains the complexity of the supply chain in transformer industry, providing an insight into the characteristics of supply markets, products, and methods for supply chain optimization.

Saqib Saeed and **Shirin Sheppard** address the highly fragmented and competitive global distribution transformers market.

Diego Robalino, in his article, discusses the application of dielectric frequency response for the analysis of the insulation in MV, HV, and EHV instrument transformers.

Marius Grisar provides a review of the classical bathtub for failure hazards and the foremost probability of failures in the middle life period.

Manuel Bolotinha advises on the proper preventive maintenance and planned inspections of equipment up to 800 kV.

Mislav Trbusic et al. article deals with the basic concept of the transformer's heat utilization in which a proposed technical solution anticipates the installation of an additional oil-water heat exchanger in the transformer's cooling system.

Sruti Chakraborty and **Alberto Zotto** present the advantages and challenges of using artificial intelligence for substation transformer management.

Christian Enk and **Martin Pfanner** explain different testing challenges and the possibility of achieving a higher efficiency using an optimized testing approach.

Mark Kuschel et al. summarize the status of the SF6 alternative solutions from the high-voltage switchgear point of view.

If you would like to comment on some of the articles or claims in this magazine, feel free to contact me anytime. I wish you a joyful reading.



Mladen Banovic, Editor-in-Chief



New management team announced for Siemens Energy

Siemens Energy presented its new management team to its employees today. In addition to an Executive Board, the company will have an expanded international management team, the Group Management Committee.

Once Siemens Energy becomes a legally separate entity, this team will be instrumental in implementing the company's strategic approach.

In addition to his current role as Chief Operations Officer, Tim Holt will be nominated for the position of Labor Director of Siemens Energy.

Jochen Eickholt, who is currently Chairman of the Portfolio Companies (POC) of Siemens AG, is a new member of the Siemens Energy management team.

Source, Photo: Siemens



Kenya Power appoints new CEO

The Kenya Power Board of Directors has appointed Bernard Ngugi as the Managing Director & Chief Executive Officer of the Company.

Prior to his appointment, Ngugi was the Company's General Manager in charge of Supply Chain. He takes over from Eng. Jared Othieno who has been the Acting Managing Director & CEO since July 2018 when he was appointed to the position following the exit of the former Management team. Ngugi has over 30 years' experience in the Company with expertise in financial and revenue accounting, internal audit and supply chain management. He holds a Master of Business Administration in Finance and Bachelor of Commerce in Accounting.

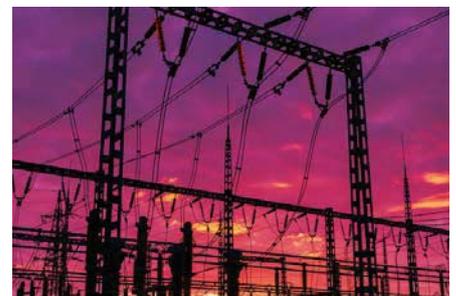
Source: ESI Africa Photo: Kenya Power



ABB wins one of its biggest ever contracts to connect world's largest offshore wind farm

ABB has been selected by energy companies SSE Renewables of the UK and Equinor of Norway to supply its high-voltage direct current (HVDC) Light[®] converter systems to connect the world's largest offshore wind farms in the Dogger Bank region of the North Sea to the UK transmission network.

In the first ever use of the HVDC technology in the UK's offshore wind market, ABB will supply technology with one of the smallest environmental footprints, due to the most compact station design combined with the lowest energy losses in the power industry. ABB will supply the HVDC Light[®] converter systems, while Aibel will deliver two HVDC offshore converter platforms. Source: ABB



Siemens to build digital substation with grid IoT applications in Norway

Norway: Together with the Norwegian distribution system operator Glitre Energi Nett, Siemens will build a digital substation to pilot Internet of things (IoT) analytics and applications for power grids.

IoT-ready Siprotec protection and control and Sicam automation devices will be connected via OPC UA PubSub, an open standard communication protocol, to MindSphere – the Siemens cloud-based open operating system for IoT. The Siprotec dashboard cloud application will make previously inaccessible data fully available and help to process grid data for the first time in the cloud with zero engineering effort. Source: T&D World