M.A. El-Sharkawi and R.J. Marks II, "Localization of Winding Shorts Using Fuzzified Neural Networks,"
Electrical Engineering Industrial Consortium, Seattle, Washington, November 9, 1994.

Annual Review and Industry/Student Dinner November 9, 1994

ELECTRIC ENERGY INDUSTRIAL CONSORTIUM

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Presentation Schedule | **Wednesday, November 9, 1994**

Annual Review

University of Washington
Electrical Engineering Building

Room 108

1:15 pm	**Welcome and Status of EE Department** G.L. Zick, Chairman
1:20	**EEIC Annual Report** S.S. Venkata
1:30	**Localization of Winding Shorts Using Fuzzified Neural Networks**, M.A. El-Sharkawi and R.J. Marks
2:30	**Modeling and Simulation of Custom Power Devices in Distribution Systems**, S.S. Venkata and P.O. Lauritzen
4:00	**Task Adaptive Visualization** R.D. Christie

Room 117 2:00-5:00 **Open House**
Poster Session

Industry/Student Dinner

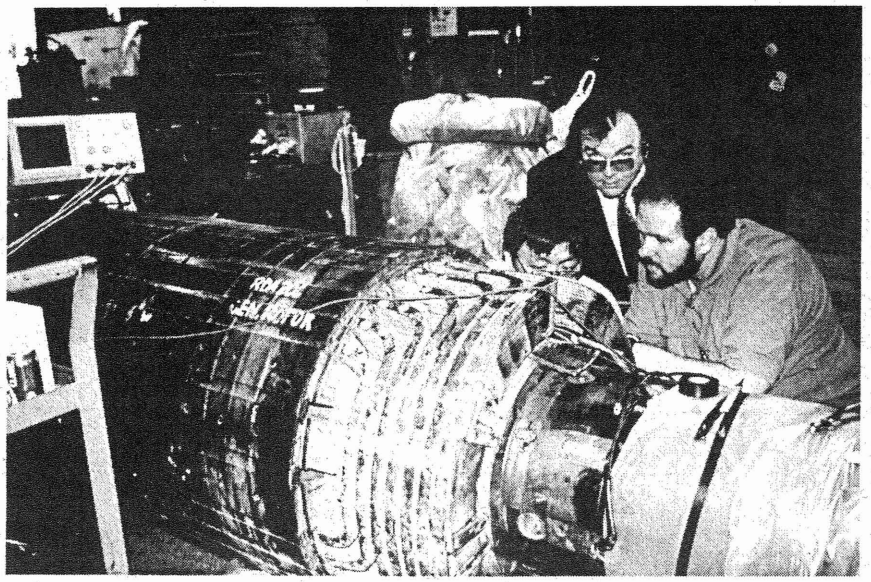
The Faculty Club
University of Washington

5:00-6:00 pm	**Social Hour** Music Room, The Faculty Club
6:00-7:00	**Dinner and Poster Award Presentation** Main Dining Room, The Faculty Club
7:00-7:45	**Keynote Address** Mr. John Spencer, Snohomish PUD No. 1 *"Competition in the Electric Utility Industry"*
7:45-8:15	**Question and Answer Session**

M.A. El-Sharkawi

R.J. Marks

Localization of Winding Shorts Using Fuzzified Neural Networks



Shorted turns in the field winding of large turbogenerators (2 or 4 poles) are a common problem whose detection and localization have remained elusive. Shorts occur primarily from incessant pounding of the rotor copper conductors while the machine is turning in low gear. This low speed operation is designed to avoid the deformation of the shaft that occurs when the rotor remains stationary in the bore for long periods of time.

The pounding of the copper conductors results in the accumulation of copper powder within slots. When the machine is subsequently energized, the copper dust causes arcing between the turns in the slot. Over time, a full short circuit between turns may result. Broken rotor conductors and water intrusion may also cause short turns. In many instances, the rotor short turns are speed dependent, i.e., the fault tends to disappear once the machine is brought to a standstill. This makes the determination of such a fault difficult.

In this research work, a neural network with a fuzzy logic output is used to localize the shorted turns. The proposed detection method was tested in the Southern California Edison facilities on a 60 MVA turbogenerator. The generator has 14 coils with 17 turns per coil. Shorts between windings were intentionally made to test the proposed technique. Training patterns were collected. A neural net was trained by using the field data. After the training, the NN was tested with 60 short locations at various points in the field winding. The network identified the location of the short with a very high degree of accuracy. The developed method is quite general and can potentially be applied to localizing short turns in power devices such as transformers and motors.

EEIC

The Electric Energy Industrial Consortium (EEIC) at the University of Washington was established in 1983. It is a premier collaborative program with electric power-related industries. The program mutally benefits the Electrical Engineering Department's academic program in the Electric Energy specialty and also aids industry's growth and development.

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G.L. Zick, UW*
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Energy Group

The Energy Group is an academic unit within the Department of Electrical Engineering. The faculty members and students of the Group are engaged in research and teaching activities concerning electric energy, which includes power electronics and power systems. This group represents the UW in the EEIC activities.

Faculty Members

F.R. Bergseth • R.D. Christie • M.J. Damborg • M.A. El-Sharkawi • J. Giri • P.O. Lauritzen
C.C. Liu • R.J. Marks II • S.S. Venkata • Z. Sumic • J. Szablya • H.P. Yee