



## President's Column

Warmest wishes to all of you for a happy and prosperous 2001. I am thrilled to have been elected President of PELS at such an exciting time in the life of our Society. I am convinced that there has never been a better time to be a member of PELS and the IEEE. Innovative programs are in process and a healthy bottom line affords us numerous possibilities to enhance service and value to our members.



There are several directions in which the Society is moving to accomplish its goals. I am extremely pleased to announce to you that the cooperative agreement between PELS, Industry Applications, Power Engineering, and Industrial Electronics Societies has now been signed. As I write this we are in the process of working out the implementation details that will allow for reduced rate concurrent membership in the 4 societies, all of which have activities and publications in power electronics. The agreement also calls for the encouragement of joint chapters, and access to distinguished lectures from any of the societies, by any chapter.

Improved access to technical information, especially electronic access, is an important goal for PELS in the near future. The intersociety agreement is but one avenue that will help in this endeavor. PELS is committed to making all past PESC conference proceeding available electronically to all members, as soon as possible, at no additional cost. Furthermore, future conference proceedings will be made available to you only six months after the conference. I am also committed to investing in new initiatives, such as an all-electronic publication of short and very current research papers/summaries, and a magazine for practicing PE engineers.

We all know that power electronics is a key enabling technology in a vast array of applications areas. I strongly believe that we need to do a better job of communicating this to the rest of the engineering and scientific community. Most critically, students and new engineers need to be made aware of the exciting and important chal-

*Continued on page 9*

## PELS Members Named as IEEE Fellows

The IEEE Fellow Committee has named 256 IEEE Senior Members to Fellow Grade effective January 1, 2001. The membership grade of Fellow is conferred each year on not more than one-tenth percent of the total IEEE membership to recognize distinction in the field of electrical and electronic engineering.

Recognition of new Fellows is the culmination of a rigorous evaluation process that begins almost a year in advance. The process begins with the nominator, who is responsible for preparing the Fellow Grade Nomination Form, soliciting five to eight references capable of assessing the candidate's contributions, and identifying the IEEE Society/Council whose evaluating committee will assess the candidate's technical qualifications and contributions.

Next the Fellow Committee, comprised of 25 members plus a chair, has the main task of recommending candidates to the Board of Directors in accordance with the following criteria: a current Senior Member with five years of service in any membership grade, individual contributions, evaluation by the Society/Council selected by the nominator, evidence of technical accomplishment, confidential opinions of references, service to other professional engineering societies, and total years in the profession.

*Continued on page 9*

## PESC® 2001 Expands in Vancouver

The 2001 Power Electronics Specialists Conference (PESC) will be held in Vancouver B.C., Canada. Ranked one of the world's top ten cities for the third year in a row by readers of the prestigious *Conde Nast Traveler Magazine*, Vancouver is set amid majestic mountains, evergreen forests, and the sparkling blue Pacific Ocean. Clean and safe and blessed with a mild climate, this cosmopolitan city offers an unending array of activities, reflecting both the grandeur of its surroundings and the multiculturalism of its residents. Stanley Park,



*Continued on page 7*

## Plans Finalize for APEC® 2001

To remove any stress for APEC 2001 attendees the city of Anaheim and the Disneyland Resort spared no expense to make your visit both user friendly and memorable. They have invested \$4.2 billion transforming the city of Anaheim into a tourism and convention mecca. We are fortunate to be at the right place at the right time; i.e., after the grand opening of Disney's new 750 room Grand Californian Hotel and the California Adventure (a 55-acre theme park), and before the summer crunch.



The Disneyland Hotel is now accepting reservations at our special rate of \$142 for single occupants and \$154 for doubles. This represents a 15% discount from last year's room rates in New Orleans. To place your reservation call 714-956-6425 prior to Jan 29, 2001, and mention the APEC 2001 Conference.

We also plan to provide discounted airfares from a major carrier. As of this writing I cannot provide a specific airline name or conference ID#. This information will be posted on the APEC web site.

*Continued on page 8*

### In This Issue

President's Column .....	1
IEEE Fellows Named .....	1
PESC® '01 Preview .....	1
APEC® '01 Final Plans .....	1
Quicker News Delivery .....	2
Awards Nominations, Final Call .....	2
IEEE Standard 1515 Published .....	2
Professional Activities Info Online .....	2
AdCom Election Results .....	3
INTELEC® Fellowship .....	3
APEC® '01 Flyer .....	4
Tricks of the Trade®: RHP Zero .....	5
AdCom Meeting Minutes Summary .....	7
PESC® '01 Flyer .....	8
Professional/Political Activities .....	9
NSF Workshop Recap .....	10
INTELEC® '01 Call for Papers .....	11
Meetings of Interest .....	12

## Quicker News Delivery

The *Power Electronics Society Newsletter* is available on the internet in electronic PDF format much sooner than hardcopies can be printed, labeled, and delivered by postal mail. To receive email notification when the newsletter is posted on the PELS server, go to <http://www.pels.org/Mailing/MailForm.html> and add your name to the notification service list.

## Book Reviews

This issue has no book review because none were submitted. Please send the editor a short prioritized list of outstanding technical books that you would be willing to review and share with your colleagues.

### IEEE Power Electronics Society Officers

**Thomas Habetler, President**  
**Dean Patterson, V. P., Operations**  
**F. Dong Tan, V. P., Meetings**  
**Steven B. Leeb, Treasurer**  
<http://www.pels.org>

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News items should be sent to: Gene Wester, Editor, *PELS Newsletter*, Jet Propulsion Laboratory, M/S 303-300, 4800 Oak Grove Drive, Pasadena, CA 91109-8099, USA; TEL: +1 818 354 3489; FAX: +1 818 393 4272; EMAIL: [gwester@jpl.nasa.gov](mailto:gwester@jpl.nasa.gov). Deadlines for copy are March 15, June 15, September 15 and December 15. Submission of items by email in plain-text format is preferred. Plain-text (straight ASCII) submissions on 3.5" diskettes are welcome, and should be accompanied by a backup printout. Fax submissions are acceptable, but are least desirable. Full-page calls for papers and announcements of PELS-sponsored conferences are welcome and should be sent as both high-quality hard copy and RTF format file.

The editor gratefully acknowledges the Jet Propulsion Laboratory for significant support of his editorial activities.

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## Final Call for Awards Nominations

Nominations for the Power Electronics Society's three major awards for 2001 are due now. The William E. Newell Power Electronics Award, the Richard M. Bass Outstanding Young Power Electronics Engineer Award, and the Distinguished Service Award recognize outstanding contributions to the field of power electronics or to the Society. These three awards, the Prize Chapter Award and the PELS Transactions Prize Paper Awards will be presented at the awards banquet at PESC 2001 in Vancouver, BC, Canada in June 2001.

PELS members are urged to nominate worthy candidates to supplement the recommendations of the nominating committees for the awards. The nominator plays a crucial role in the activities leading to the selection of a recipient, and can take pleasure second only to that of the winner when the award is announced.

Make your nomination today, and fax it to the PELS Awards chair. Nomination forms were printed in the October 2000 issue of this newsletter. The forms are also available for downloading at the PELS web site [www.pels.org](http://www.pels.org).

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## New IEEE Standard 1515-2000 Published

On September 21, 2000, the IEEE Standard Board published the IEEE Std 1515-2000: Recommended Practice for Electronic Power Subsystems: Parameter Definitions, Test Conditions, and Test Methods. IEEE Std 1515 is sponsored by PELS Standards Committee and was drafted by the IEEE Working Group on P1515.

The purpose of IEEE Std 1515-2000 is to standardize on specification language, not to specify, nor to enforce "a standard specification." A specification written in compliance with this language will ensure easy and precise understanding between manufacturers and users, without in any way limiting a manufacturer's ability to present features that are unique to their products. Many companies have already started using the standard. "It (1515) provides the basis that allows everyone to speak the same language on a level playing field," says Don Staffiere, President of the Power Sources Manufacturers Association.

For a copy of the IEEE Std 1515-2000, visit <http://standards.ieee.org/catalog/olis>.

P1573 is a sister document that is being developed by the same group of people. Whereas 1515 focuses on internal parameters, P1573 focuses on parameters at the system level. P1573 is targeted for completion in 2002.

*F. Dong Tan*  
 Chair, IEEE P1515 Working Group  
 Email: [Dong.Tan@trw.com](mailto:Dong.Tan@trw.com)

## Professional Activities: IEEE-USA Information Online

Most existing IEEE professional (non-technical) activities are within IEEE-USA. Information about these can be found on the world-wide web. Here are some IEEE web sites and the professional programs that they reference. Readers can get the flavor of professional activities by examining these web sites.

1. Encourage Congress about pension portability <http://congress.nw.dc.us/ieee/>
2. Retirement security <http://www.ieeeusa.org/grassroots/pensions/index.html>
3. IEEE-USA public policy forum, containing news and links to topics: aerospace policy, career maintenance, intellectual property, R&D policy, workforce, energy policy, etc. <http://www.ieeeusa.org/forum/index.html>

4. IEEE-USA work on future telecommunications infrastructure <http://ieeeusa.org/committees/CCIP/>

5. Letter from IEEE-USA President Buckley to US Congress about the Uniform Computer Information Transaction Act (UCITA) <http://www.ieeeusa.org/intro/buckley/buckleyjune00.html>

6. To see if your state legislature has taken up UCITA, and what you can do in response <http://ieeeusa.org/grassroots/ucita>

There are many other IEEE-USA web sites containing information about professional activities. In response to reader interest, I can acquaint you with more sites. Inquiries are welcome.

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## AdCom Election Results Habetler Named as PELS President

Thomas Habetler of the Georgia Institute of Technology will lead the Power Electronics Society as President in 2001. He was elected to a one-year term by the Society Administrative Committee and succeeds Philip T. Krein who becomes a Past President.

Habetler had been Vice President-Operations the past two years. Krein had served two years as President – the statutory term limit – and will head the Nominations Committee and will serve as Electronic Media Editor. Succeeding as VP-Operations is Dean Patterson of Northern Territories University, Darwin, Australia.

F. Dong Tan of TRW, Redondo Beach, Calif., was elected Vice President-Meetings and Chair of the Meetings Committee. He replaces Kevin Fellhoelter of Tyco Electronics, Coppell, Texas, who becomes an at-large AdCom member.

The new PELS Treasurer is Steven Leeb of the Massachusetts Institute of Technology. He succeeds Arthur Witulski of the University of Arizona who resigned to participate in a seminary program.

Elected to three-year terms on the Society AdCom were Fellhoelter; Rik DeDoncker of RWTH-Aachen, Germany; Johan H.R. Enslin of LEMA, Arnheim, The Netherlands; Hirofumi Matsuo of Nagasaki University, Japan; Rene Spee of Smith Industries, Vandalia, Ohio; and Charles Sullivan of Dartmouth College, Hanover, NH.

Retiring from the AdCom at the end of 2000 were Jaime Arau of CENIDET, Cuernavaca, Mexico; Arthur Kelley of North Carolina State University, Raleigh, NC; Francesco Profumo of the Politecnico di Torino, Torino, Italy; J. Daan Van Wyk of Virginia Polytechnic Institute; and Thomas G. Wilson, Jr. of Artesyn Industries, Eden Prairie, Minn.

Other members of the AdCom include Hirofumi Alkati of Tokyo Institute of Technology, Japan; Dusan Borojevic of Virginia Polytechnic; William G. Dunford of the University of British Columbia; Mark Jacobs of Tyco Electronics, Mesquite, Texas; Keyue Ma Smedley of the University of California, Irvine; Katsuichi Yotsumoto of NTT, Tokyo, Japan; Braham Ferreira of Delft University of Technology, Delft, The Netherlands; D. Graham Holmes of Monash University, Melbourne, Australia; Jose Antenor Pomilio of the University of

## FELLOWSHIP ANNOUNCEMENT



The Advisory and Conference Executive Committees of the International Telecommunications Energy Conference (INTELEC®) have established an annual \$10,000 Fellowship.

### Eligibility

The recipient must be an Electrical Engineering graduate student who is specifically involved in areas of power electronics applicable to communications. The applicable systems include wireline, optical, wireless, or any combination of systems including the internet and older imbedded telecommunications systems. Alternative energy systems for the communications network are also applicable.

This Fellowship is open to individuals from all countries. It is a one-time grant; i.e., recipients are ineligible for INTELEC Fellowship awards in subsequent years.

### Application Process

Applicants should submit:

- a short essay (no more than one page) explaining how their proposed project can be applied to the powering of communications systems.
- a transcript of their grades
- a letter of support from their Academic Graduate Advisor

These materials should be submitted **by February 28, 2001** to the Chairman of the IEEE Power Electronics Society Educational Activities Committee:

*Professor Dean Patterson  
C/o Professor Jerry Hudgins  
Dept of Computer and Electrical Engineering  
Swearingen Engineering Centre  
University of South Carolina  
Columbia, South Carolina 29208 USA*

The INTELEC Fellowship recipient will be notified by 15 April 2001.

Campinas, Campinas, Brazil; Seth R. Sanders of the University of California, Berkeley; F. Dong Tan of TRW; and Tore M. Undeland of the Norwegian University of Science.

President Habetler has appointed a slate of committee chairs for the year. The appointments include:

Asian Liaison - Tatsuo Sakai  
Automotive Power - Randy Frank  
Awards - Chris Riddleberger  
Chapters - Jaime Arau  
Computers in PE - Antonello Monti  
Constitution and Bylaws - Keyue Smedley  
Education - Marcelo Simoes  
ETTC - John DeCramer  
European Liaison - Rik DeDoncker  
Fellow Evaluation - J. Daan van Wyk  
History - Bill Sayle  
Intersociety - Dean Patterson  
Long Range Planning - Jerry Hudgins

Membership/Publicity - Enrico Santi  
Newsletter - Gene Wester  
Power Packaging - Doug Hopkins  
Publications - Ronald Harley  
Region 9 Liaison - Miguel Velez-Reyes  
Standards - Jason Lai  
Transactions - Art Kelley  
Electronic Media - Phil Krein  
APEC Steering - Chuck Mullett,  
F. Dong Tan  
PESC Steering - Gerry Hurley  
Nominations - Phil Krein  
TAB Intelligent Transportation -  
Dean Patterson  
TAB Newsletters - Gene Wester  
TAB Public Relations - Enrico Santi  
TAB Transactions - Art Kelley  
IEEE Press - William Hazen  
IEEE Standards Board - Jason Lai  
*Submitted by Bob Myers  
PELS Administrator*



present

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 and the Power Sources Manufacturers Association

## Tricks of the Trade: Understanding the Right-Half-Plane Zero in Small-Signal DC-DC Converter Models<sup>®</sup>

Contributed by D. M. Mitchell  
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 Cedar Rapids, Iowa  
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It is well known that the small signal control-to-output transfer function for virtually all non-buck topologies includes a right-half-plane (RHP) zero [1]. A Bode plot of the control-to-output transfer function of a typical boost converter is shown in Fig. 1. In this typical example case, the effective resonant frequency is approximately 2 kHz and the frequency of the RHP zero is approximately 20 kHz (where there is 45° additional phase lag). Because of the potential 270° phase shift and the fact that both the effective resonant frequency and the RHP zero are dependent upon the dc operating point, only narrow band lag compensation is generally appropriate for standard voltage-mode controlled non-buck topologies. Control systems engineers refer to systems with RHP zeros as *non-minimum-phase systems*. Such systems can be very difficult to design to provide good closed-loop behavior [2]. The narrow gain-bandwidth limitation of voltage-mode control as applied to non-buck derived converters can be overcome with current-mode control, where an inner current feedback loop is used in addition to the outer voltage feedback loop. There has been much discussion over the years on whether current-mode control causes the RHP zero to “disappear.”

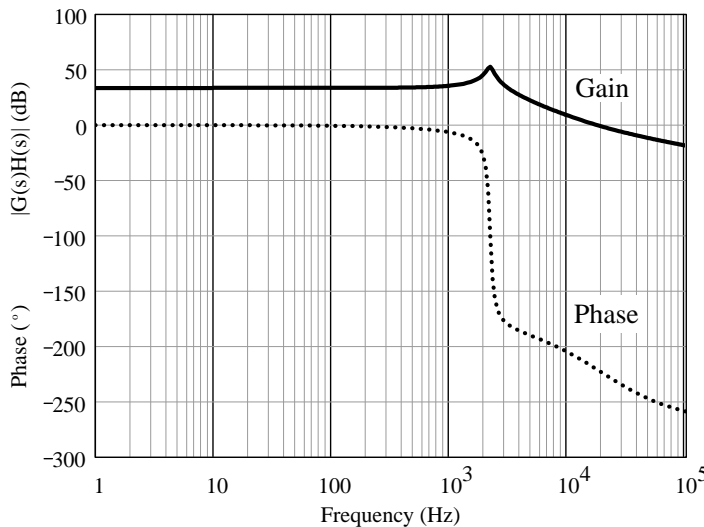


Figure 1. Control-to-output transfer function for typical boost converter

The controversy stems from the fact that the loop gain function for a multivariable control system is not unique. This situation is not confined to power regulators; nevertheless, without loss of generality it will be illustrated using a simplified two-loop block diagram of a current-mode-controlled switching regulated power supply, as shown in Fig. 2a. In accordance with well-known feedback theory [3], the closed-loop input-to-output transfer function of a single loop is the forward gain divided by the sum of one plus the loop gain. This two-loop diagram can easily be transformed into a single-loop diagram as shown in Fig. 2b simply by applying the feedback theory to just the inner loop and replacing it with an

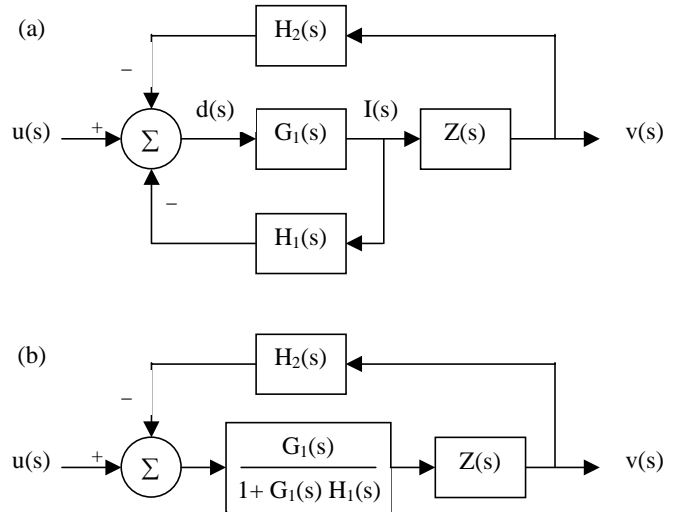


Figure 2. Generalized two-loop flow graph: (a) Original two-loop representation, (b) Equivalent single-loop representation

element whose gain is  $G_1/(1 + G_1 H_1)$ . We now have an input-to-output transfer function that can be described by the equation,

$$\frac{v}{u} = \frac{\frac{G_1 Z}{1 + G_1 H_1}}{1 + \frac{G_1 Z H_2}{1 + G_1 H_1}} = \frac{\frac{G_2}{1 + G_1 H_1}}{1 + \frac{G_2 H_2}{1 + G_1 H_1}}$$

where  $G_2 \equiv G_1 Z$  is the forward gain of the voltage loop without current feedback. Note that  $G_1(s)H_1(s)$  is the loop gain of the inner current loop, and  $G_2(s)H_2(s)$  is the loop gain of the outer voltage loop, where each loop in turn is considered to be the only feedback loop. The input-to-output transfer function can be simplified by multiplying numerator and denominator of the transfer function by  $1 + G_1 H_1$ .

$$\frac{v}{u} = \frac{G_2}{1 + G_1 H_1 + G_2 H_2}$$

Then, two possible system loop gain functions to consider are:

1.  $G_1(s)H_1(s) + G_2(s)H_2(s)$
2.  $G_2(s)H_2(s)/(1 + G_1(s)H_1(s))$

The first represents the total effect of feedback control upon the original power circuit, and can be verified using Mason’s Rule [4] applied to the corresponding signal flow graph. The second form represents the effect of the voltage loop upon a new power circuit that consists of the original power circuit with the current loop closed.

The individual current and voltage loop gains for a typical stable, wide-bandwidth, current-mode-controlled boost converter are shown in Fig. 3. Note that the voltage loop provides higher gain at low frequencies, and the current loop provides higher gain at high frequencies—in this case above approximately 10 kHz.

The loop gain function formed by  $G_1(s)H_1(s) + G_2(s)H_2(s)$  is shown in Fig. 4, and the loop gain function formed by  $G_2(s)H_2(s)/(1 + G_1(s)H_1(s))$  is shown in Fig. 5. Note how different these two

Continued on page 6

## Tricks of the Trade: Understanding the Right-Half-Plane Zero in Small-Signal Dc-Dc Converter Models

continued from page 5

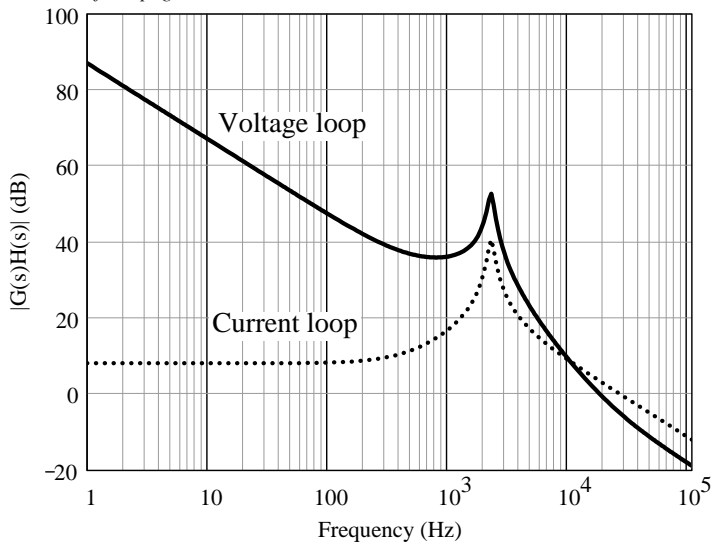


Figure 3. Loop gain of the current and voltage feedback loops for a typical current-mode-controlled boost converter

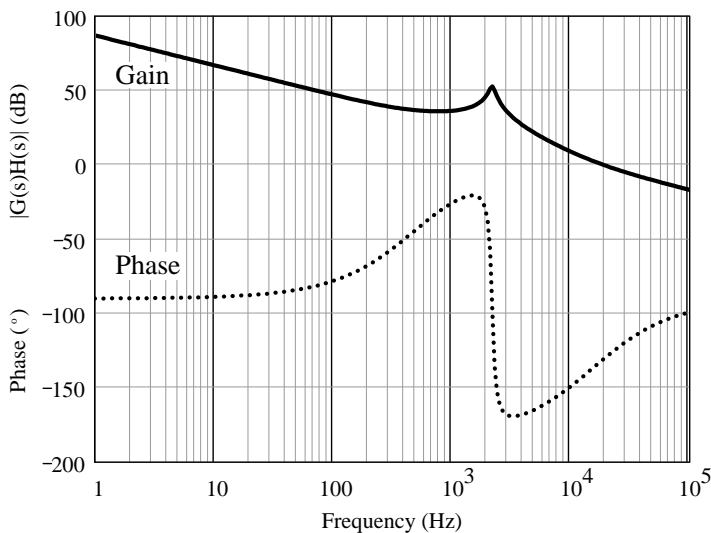


Figure 4. "Sum of loops" representation of loop gain

loop gain functions appear even though they represent the same system. In fact, their gain-bandwidths and gain/phase margins are quite different from each other, even though the point of actual instability must be the same for each. Furthermore, it is obvious that the closed loop performance of the system is totally independent of which loop gain function the designer chooses to use.

Since energy stored in the output capacitor is first stored in the inductor, the current loop can be considered to provide lead compensation to the system. It can be shown [5] that for the boost converter representation in Fig. 4, the lead information provided by the current loop corresponds to a LHP zero that overrides the RHP zero inherent to the power circuit and tracks the resonant frequency as the dc operating point is changed. Thus, the system *appears* no longer to have a RHP zero, although it is still second-order. In fact, the Bode plot looks exactly like a Bode plot for a lead-compensated buck converter. For the representation in Fig. 5, the inductor can be thought of as being replaced by a dependent current source, thus eliminating the inductor current as a state variable. As a result, the system *appears* to be first order, although it still has a RHP zero.

From an analytical point of view, both representations are equally valid. However, from a physical point of view, the representation in Fig. 5 makes more sense as it allows the system to be compared directly to voltage-mode controlled systems and permits standard measurement techniques for verifying stability. One could argue that in comparing voltage regulator "boxes," it does not matter how many loops inside the box happen to exist. Also, for peak current-mode control, the only way the system can operate is with the current loop closed. Thus, the second viewpoint is the one that makes most practical sense, but it can be argued that the first viewpoint provides additional insight into the behavior of the system.

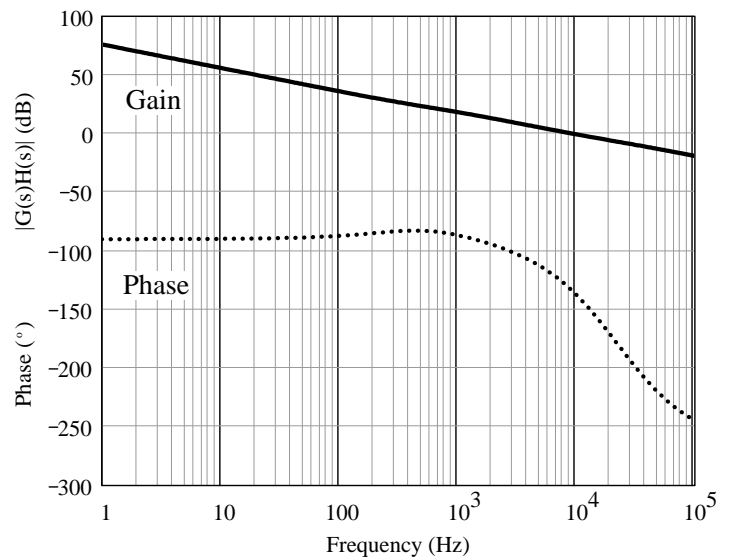


Figure 5. "Voltage loop with current loop closed" representation of loop gain

As Fred Lee said at PESC'85 during a rap session on this topic, "You can look at a cathedral from the inside or the outside and it looks quite different — but it is still a cathedral." As far as the disposition of the RHP zero in non-buck topologies is concerned, it is time we stop using the terms "right" and "wrong" and recognize that it is all in one's point of view. The cathedral could not care less.

The author would like to thank Phil Krein and Gene Wester for their valuable comments and suggestions.

- [1] G.W. Wester & R.D. Middlebrook, "Low-Frequency Characterization of Switched dc-dc Converters," *IEEE Tr. Aerospace and Electronic Systems*, Vol. AES-9, May 1973, pp. 376-385.
- [2] B. Friedland, *Control System Design: An Introduction to State-Space Methods*. New York: McGraw-Hill, 1986, p. 78.
- [3] Philip T. Krein, *Elements of Power Electronics*, Oxford University Press, New York, 1998, Ch. 15.
- [4] S. J. Mason & H.T. Zimmermann, *Electronic Circuits, Signals, and Systems*. New York: John Wiley & Sons, 1960, Chap. 4.
- [5] D. M. Mitchell, *Dc-Dc Switching Regulator Analysis*. New York: McGraw-Hill, 1988, DM Mitchell Consultants (Reprint), 1992, Chap. 6.

*Editor's note: You are invited to send your own favorite Trick of the Trade for publication in the PELS Newsletter. Just send it in any convenient medium, spelling out symbols such as Greek letters. Also, send along a recent photo, color or b/w of any size, for insertion along with your favorite Trick.*

## PELS AdCom Meeting Minutes Summary

The Administrative Committee (AdCom) of the IEEE Power Electronics Society held its fall meeting on September 10, 2000 at the Hyatt Regency Hotel in Phoenix, Arizona, USA in conjunction with INTELEC 2000. The highlights of that meeting are summarized below. For complete meeting minutes, see the Society website at [www.pels.org](http://www.pels.org).

### Action Items

- Dean Patterson will contact authors presenting tutorials at Society conferences to seek tutorial summaries for the PELS Newsletter and the Society webpage – Deferred until the first AdCom meeting of 2001.
- Gene Wester and Bob Myers will study costs and benefits of printing and mailing the Newsletter with an outside vendor and, if warranted, an outside source be put in place as soon as practical.
- The Publications Committee will explore adding indices of papers and authors for the Society Transactions dating to its first volume in 1986, with such information made available to members.
- The Publications Committee will prepare a plan for digitized proceedings for Society conferences and workshops to be made available on-line to all members no sooner than six months after the close of a

conference.

- Phil Krein will contact presidents of sponsoring societies of the Machines and Drives Conference to encourage expanding the role of the steering committee.
- Tom Habetler will develop a plan for supporting new activities as a means of attracting new technical interests and members.
- The chair of the Publications Committee will develop a plan for publishing electronic letters on line as a separate activity from the Transactions or Newsletter and will present the plan at the next meeting of the AdCom.
- Bob Myers will write Arthur Kelley formal authorization to dispose of an old computer transferred when Kelley became Society webmaster.
- Krein and Enrico Santi will finalize a membership survey and produce and distribute the survey to PELS members.
- Krein will contact IEEE headquarters seeking a procedure for asking members for permission to be included in email lists.

### Motions

- Approved an intersociety agreement among PELS, IAS, IES and PES involving joint memberships in all four societies and other intersociety activities.

**PESC® 2001 Preview** *from page 1*  
Canada's largest urban park is home to the world-renowned Vancouver Aquarium. A city of diverse neighbourhoods, Vancouver boasts Canada's largest Chinatown, the century-old Gastown area, and fashionable Robson Street for luxury shopping. A vast selection of restaurants, many with international award-winning chefs, offers cuisine from all over the world to suit all tastes and budgets.

Approximately 600 digests were submitted for PESC 2001. That maintains the record-breaking submission level established last year in Ireland, and it both indicates consistently high interest in PESC and provides high-quality technical content. PESC obviously generates substantial interest in both Europe and North America. A total of 379 (over 62 %) digests have been accepted for presentation, and as a new departure for PESC, 150 of these will be presented as posters in the exhibitor hall in poster sessions. We expect all the oral presentations to use electronic projection techniques.

PESC 2001 has introduced the first truly electronic approach to managing the PESC

conference papers. The first phase – submission and review of digests – has been completed under the direction of Program Chairs Annette von Jouanne and Alan Wallace. We are well ahead of schedule, and we expect to post the detailed program of accepted papers on the conference website at <http://www.conferences.ubc.ca/pesc2001> by January 31.

There will be ample opportunities for exchange of ideas and information outside the formal paper sessions. We will have a number of Sunday tutorials and the traditional evening discussion sessions. These "rap" sessions have been a fixture at PESC and there has been repeated discussion about changing the name. This year we may do that, along with a more concerted attempt to involve the audience. The moderators for these sessions are still to be confirmed and details will be added to the website as they become available.

Exhibit space and sponsorship opportunities are flexible, so companies that decide to participate at the last minute are encouraged to contact the secretariat to see if facilities are still available.

Many companies with power related

- Authorized the implementation of a new technical organization under the leadership of the Vice President-Operations with initiation of the plan in conjunction with PESC'02.
- Agreed to include the Southeast Michigan Section as a co-sponsor of the 2000 Workshop on Automotive Electronics and to provide the workshop seed money of \$2,000.
- Adopted an amendment to the Society Bylaws authorizing all past Presidents of PELS as ex-officio members of the AdCom.
- Granted Dean Patterson authorization, subject to Society President approval, to designate up to \$3,000 for an EPE workshop in Europe in March, 2001, any allocation to follow a meeting of two workshop principals in Rome in October.
- Allocated \$2,000 from the 2000 education budget for expenses for designated representatives of student teams to attend a meeting of the organizing committee of the Future Energy Challenge competition in Florida in November.
- Approved a regional lecturer program proposed by Jaime Arau and amended to specify two or three lecturers in the initial phase.

*Submitted by Robert Myers  
PELS Administrator*

activities--which means almost anyone involved with hardware—are seeing a shortage of new graduates with the required power electronic capabilities. We are particularly keen to encourage student participation at PESC 2001. This includes students at all levels, with both the competition and student paper session open to all. Further details can be found on the conference website.

PESC '01 will be held at the University of British Columbia (UBC). Superbly situated at the tip of the Point Grey Peninsula with expansive views over the Pacific Ocean, the Coast Mountains, and the Vancouver skyline, the UBC is the second largest university of Canada. The UBC boasts some of the city's best attractions, including the Museum of Anthropology, the Chan Centre for the Performing Arts and the UBC Botanical Gardens. Sports enthusiasts will enjoy the Aquatic Centre with two Olympic-sized pools, tennis courts, and the 18-hole University Golf Course. Pacific Spirit Regional Park surrounds the campus with 763 hectares of mature coastal rainforest providing 35 kilometres of walk-

*Continued on page 10*



## CONFERENCE ANNOUNCEMENT

*32<sup>nd</sup> Annual*

# Power Electronics Specialists Conference

June 17-21, 2001

Vancouver, BC, Canada

<http://www.conferences.ubc.ca/pesc2001>

**PESC<sup>®</sup> provides an international forum for power-electronics experts to present and discuss papers and new ideas on the latest advances and forward-looking topics in this fast-evolving field.**

- Technical program consists of 379 papers (229 oral and 150 poster presentations)
- Five Professional Education Tutorials
- ☆ NEW ☆ Industrial Exhibits
- ☆ NEW ☆ Poster sessions with 150 poster presentations
- ☆ NEW ☆ Special Student Session with Cash Prizes
- ☆ NEW ☆ Student "Wall Crawl" Design Competition with Cash Prizes
- Active social program for participants and guests, featuring regional tours, music, art, and food
- Presentations of the Newell, Richard M. Bass, and Distinguished Service Awards

**For additional information see the related article in this issue, visit the website given above, or contact the Secretariat.**

PESC 2001 Secretariat  
 UBC Conference Centre  
 5961 Student Union Boulevard  
 Vancouver, BC, Canada V6T 2C9

Telephone: +1 604 822 1050  
 Facsimile: +1 604 822 1069  
 Email: [PEESC2001@housing.ubc.ca](mailto:PEESC2001@housing.ubc.ca)

**PESC is sponsored by the IEEE Power Electronics Society**

### APEC<sup>®</sup> 2001 Preview *from page 1*

Attendees are encouraged to bring their spouses and guests who, once registered, will receive free admission to our hospitality room, welcoming breakfast and orientation, Exposition Hall, Exposition Hall receptions, Micro Mouse contest and RAP Sessions.

At this time we have planned two tours for these guests. One tour will include a bus trip to LA to drive by the homes of the Hollywood Stars with a stop on Rodeo Drive in Beverly Hills for anyone interested in browsing or shopping. A second bus trip will go to the Getty Center in LA, where you can explore the vast and varied assemblage of European paintings, sculpture, illuminated manuscripts, decorative arts, and photogra-

phy from around the world. While there take time for a leisurely stroll through majestic splashes of floral colors in the sumptuous gardens designed by Robert Irwin.

Attendees arriving early, staying after the conference or bringing guests, will not want to miss the new "Downtown Disney" area—this eclectic mix of experiences for Resort Guests include a 12 screen Megaplex Theater, a 40,000 square foot Disney shopping plaza, House of Blues Restaurant, Rain Forest Cafe, Ralph Brennan's Jazz Kitchen, and a Disney owned ESPN Sports and Dining zone. Take a casual stroll along the lush garden-like esplanade of this 300,000 square foot retail, dining and entertainment center found just outside your hotel room.

Let me not overlook the main purpose

for attending our awesome program. Every attendee will be able to hear and/or meet the Who's Who of Applied Power Electronics to gain insight on how to stay ahead of the ever-evolving technology curve using proven and sound techniques.

Make your reservation NOW to take advantage of early registration discount. You surely do not wish to miss APEC 2001 that will be held at the Anaheim Disneyland Hotel from March 4-8, 2001. For specific information on exhibitors and program details go to [www.apec-conf.org](http://www.apec-conf.org).

I look forward to seeing you in Anaheim.

Larry Gilbert  
 APEC '01 Publicity/  
 Local Arrangements Chair

**President's Column** *from page 1*  
 lenges that are part of power electronic engineering. We need to promote our technology to meet the demand for PE engineers. In the short term, I will push for PELS to greatly increase the amount of material (especially multimedia materials) available on our website describing the art of power electronics.

Another important goal is to invest in educational opportunities for our members. Education involves communicating technical information to you, our members, in such a way that is most useful on the job. This obviously means more than just the generation and dissemination of technical literature. As presented here in past columns by Phil Krein, our Education committee has been tasked with creating videos based on conference tutorials and publishing tutorial summaries on the newsletter. You can also look forward to other initiatives in this area.

The final, and most important, goal in improving society membership is to provide opportunities for members to get involved.

## Political Aspects of Professional Activities

In past articles IEEE-USA has been used as a model of professional activities in IEEE, simply because it is well-formulated, so I will continue. There are five Councils that make up IEEE-USA. They are:

1. Career Activities Council, which tries to enhance engineering careers.
2. Member Activities Council, which focuses on benefits to IEEE members, including employment assistance.
3. Operations Council, which runs a U.S. Government Fellows program. This enables qualified IEEE members to work one year as an aide to a Congressman.
4. Professional Activities Council, which contains Committees for both Regional and Divisional professional activities.
5. Technology Policy Council. This Council studies and comments on government-funded R&D, and on government policies on energy, communications, medical technology, and aerospace.

Item 4 above contains the PACE Divisional Activities Committee (PDAC), which oversees professional activities that take place in the Technical Divisions of IEEE. This includes Division II, to which PELS belongs.

Some PDAC members have a particular philosophy in regard to professional activities in the Technical Divisions. They say that since membership in the Technical Societies is transnational, political factors should not be included in PDAC. In my

To this end, through the work of our long range planning committee, a structure has been proposed and approved to create more technical committees in PELS. These technical committees play an absolutely central role in the organization of conferences, workshops and in creating standards. Having a plan to create committees is nothing, however, without engineers like you to make them a reality. I offer the invitation to you to get involved in these committees while there are still on the ground floor. More technical information on these committees will be forthcoming in future columns.

As I said, there has never been a more exciting time to be a member of PELS! Please feel free to contact me on any of these issues or to get involved.

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opinion, this implies that divisional PACE persons should not:

1. Comment on technology policies of their nations;
2. Support legislation that enhances their careers;
3. Offer objections to legislation that adversely impacts their careers.

I believe the career environment in which engineers function is heavily influenced by local and national politics. To remain silent on government actions that could enhance or detract from our careers is to turn our collective backs on our duty to ourselves and to our profession.

I acknowledge that politics varies from nation to nation. However, I believe that professional activities in all nations should address the political factors that impact engineers' careers in their nation. Engineers are capable of obtaining political expertise in their nation. They did so in IEEE-USA. Thus I do not agree with the PDAC members who voice this philosophy. However I respect their opinions and expertise in running IEEE professional programs. Do any readers agree with me? Do any disagree? I would like to hear from you.

*Robert Bruce*  
*PELS PACE Representative*  
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*TEL: +1 718 224 9498*

## IEEE Fellows

*from page 1*

Each candidate is rated numerically, scores are computationally normalized, and candidates are then ranked. Using these rankings, and subject to bylaw limitations on the number of newly elected members, the Fellow Committee prepares its final list of candidates for submission to the Board of Directors in late fall. The Board acts upon those recommendations at its year-end meeting.

Following is an alphabetical list of the nine new Fellows who are members of the Power Electronics Society:

- Rik W.A.A. de Doncker, Aachen University of Technology, Aachen, Germany; for contributions to the development of high-power resonant soft-switching converters and high-performance digital control of induction machines.
- Robert Warren Erickson, University of Colorado, Boulder, CO; for contributions to switching converter modeling, control, and topologies.
- George D. Gregory, Square D Company, Cedar Rapids, IA; for leadership in the development of electrical power circuit protection products, circuit protection information and standards.
- Milan Miodrag Jovanovic, Delta Products Corporation, Research Triangle Park, NC; for contributions to high-frequency power conversion techniques.
- Ramu Krishnan, Virginia Tech, Blacksburg, VA; for contributions to the development of AC and switched reluctance motor drives.
- Tamotsu Ninomiya, Kyushu University, Fukuoka, Japan; for contributions to the development of high-frequency switching power converters.
- Kouhei Ohnishi, Keio University, Yokohama, Japan; for contributions to the development of disturbance observer and its applications to motion control.
- Muhammad H. Rashid, University of Florida, Pensacola, FL; for leadership in power electronics education and contributions to the analysis and design methodologies of solid-state power converters.
- Krishna Shenai, University of Illinois, Chicago, IL; for contributions to the understanding, development and application of power semiconductor devices and circuits.

The complete list of new fellows, along with details of the nomination process, can be found at <http://www.ieee.org/about/awards/fellows/fellows.htm>.

## Recap of NSF Multimedia Workshop

A joint meeting of the NSF Workshop entitled "Multimedia Delivery of Modern Power Electronics Curriculum" and DOE's "2001 Future Energy Challenge Competition" was held November 11-13, 2000 in Orlando, Florida. This workshop was co-sponsored by the Power Electronics Society; the Center for Power Electronics and Systems at VPI, and the University of Central Florida. The objective of the workshop was to assess current multimedia efforts and explore new means to develop multimedia-based instruction in the area of power electronics. The workshop discussed various delivery technologies available and how to implement them into power electronics courses. It also provided the opportunity to exchange ideas between experts regarding the use of web technology in teaching power electronics.

The opening session of the workshop featured a presentation on "distributed learning" by Dr. Steven Sorg, Assistant Vice President and Director of Distributed Learning, University of Central Florida, and a keynote speech by Prof. Timothy N. Trick, Director of the Anderson Laboratory for Global Education in Engineering at the University of Illinois.

A total of 15 papers were presented at the workshop in three sessions:

1. Web-Enhanced Courses in Power Electronics, chaired by Philip Krein, University of Illinois (4 papers),

2. Web-Based Power Electronics Education, chaired by Malik Elbuluk, University of Akron (5 papers), and

3. Related Web-based Courses, chaired by Muhammad H. Rashid, University of West Florida (6 papers).

The first session featured four papers on web-enhanced courses in power electronics. The first paper entitled "A Web-Based Self-Study Course on Fundamentals of Power Electronics" was presented by Muhammad H. Rashid from the University of West Florida and was co-authored by Alan Trembly from the IEEE Educational Activities. Then Philip Krein presented a paper on his experience with a full web-based power electronics course at the University of Illinois. I presented a paper entitled "Web-Based Delivery of the First Power Electronics Course," sharing with the participants my experience in using Web-CT in teaching the first power electronics course at the University of Central Florida. The last paper entitled "Web-Based Learning Module for Power Electronics: a Case Study" was presented by V. Rajagopalan from Quebec, Canada.

The second session consisted of five papers that emphasized the current web-based activities in power electronics at various schools. A paper presented by Miguel Velez-Reyes and co-authored by Elizabeth Tranter talked about the educational activities of the NSF Center for Power Electron-

ics Systems (CPES) at VPI. Ned Mohan and his colleagues at University of Minnesota presented a paper on their experience in Multi-Media Delivery of Modern Power Curriculum. The remaining three papers focused on the required environment for web-based education.

The third session focused on using multimedia tools for teaching power electronics and related courses. The first paper was presented by Malik Elbuluk, who talked about the Internet-based certificate program in motion-control systems at the University of Akron. The remaining papers addressed other multimedia tools for teaching power electronics related courses such as electric drives, EMC/EMI, remote wiring in electronics and power electronics, and load management and power quality. Please refer to the workshop proceedings for more details. To obtain copies send your request via email to the Workshop Chair.

Special thanks to Drs. Malik Elbuluk, University of Akron, Philip Krein, University of Illinois, and Muhammad Rashid, University of West Florida who served as members of the review committee for the workshop.

*Issa Batarseh*  
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**PESC® 2001 Preview** *from page 7*  
ing and biking trails, many leading directly to sandy beaches. The campus is a secluded haven, yet only 20 minutes from Vancouver International Airport and 10 kilometres from downtown Vancouver.

An exciting social program is planned for both delegates and their guests. A concert and reception will be held in the state-of-the-art Chan Centre for the Performing Arts, both an architectural and an acoustic marvel. The conference banquet will be a traditional First Nations salmon barbecue on the grounds of the Museum of Anthropology, a spectacular award-winning building designed by renowned Canadian architect Arthur Erickson to reflect the post-and-beam structure of Northwest Coast Indians. Delegates and guests will have an opportunity to view the exhibits, emphasizing the artistic achievements of the Northwest Coast Indians, either on their own or with the knowledgeable Museum guides, and to purchase unique gifts in the Museum Shop.

The guest program includes a "get acquainted" breakfast on the first day followed by a bus tour of Vancouver with lunch in beautiful Stanley Park. Guests may choose from a selection of tours showcasing both Vancouver and its surroundings. Planned events are a trip across the Strait of Georgia to beautiful Vancouver Island with a visit to the world-renowned Butchart Gardens and time to explore Victoria's scenic harbour; a visit to the year-round recreational paradise of Whistler Resort with a ride up to the top of the mountain for lunch; and a guided walking tour of Vancouver's Chinatown with a visit to the Chinese Cultural Centre Museum and an authentic Chinese lunch.

Vancouver is the ideal starting point for pre or post-conference travel throughout British Columbia, Alberta and Washington State. Outdoor enthusiasts can enjoy a wide variety of activities such as hiking, fishing, boating, golfing, and sightseeing. Vancouver also serves as the departure point for cruises to Alaska.

If you plan on arriving a day or two early, you may wish to join a Sunday excursion. The historic Royal Hudson steam train takes you on a leisurely two hour trip along scenic Howe Sound to Squamish, where you will board the MV Britannia to cruise back to downtown Vancouver in time to return to UBC for registration and the opening reception.

In addition to conference information the PESC 2001 website (see above) has links to detailed information on The University of British Columbia, Vancouver, and the Province of British Columbia.

Delegate accommodations are on a first-come, first-served basis, and early reservations are highly recommended as there is no alternative hotel space within walking distance.

*Bill Dunford*  
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**CALL FOR PAPERS**  
*Twenty-third*  
**International Telecommunications  
Energy Conference**



**October 14 – 18, 2001**  
**EICC, Edinburgh, UK**

**Website: <http://conferences.iee.org/INTELEC2001/>**

Papers are now invited for the twenty-third International Telecommunications Energy Conference INTELEC which will be held at Edinburgh International Conference Centre (EICC), Edinburgh, Scotland from 14 – 18 October 2001.

Returning to the UK for 2001, this well established event is being organised by the IEE (Institution of Electrical Engineers) in association with VDE, and with technical cooperation of the Power Electronics Society. The conference offers a unique opportunity to present and discuss technical issues with a large cross-section of telecom operators, manufacturers and service providers and enables participants to learn about current policies and trends in the industry. The conference also provides a forum for designers, manufacturers, distributors and users to discuss developments, ideas, and experiences in all aspects of energy and power for communications systems, including IP and multimedia applications.

**Conference Theme: “No Power, No Service, No Revenue”**

Papers are sought on a wide range of energy topics including telecom power and cooling issues, such DC power systems, UPS systems, batteries, distribution power and AC power systems. Powering and cooling topics will include telephony, cable, mobile and office. Environmental issues such as energy conservation, energy-efficient design and prime power systems will also be discussed.

**To Submit A Proposed Paper**

Authors should email a short biography, plus a synopsis of a maximum of 500 words indicating the main points and key novel aspects of the paper **by 19 February 2001**. Abstracts must be sent as an email attachment to [intelec@iee.org.uk](mailto:intelec@iee.org.uk), in Word 95/97 or pdf format.

**For Further Information**

Contact details: INTELEC 2001 Secretariat, Events Services, Savoy Place, London WC2R 0BL, UK  
Tel: +44 (0) 20 7344 5472/5471 Fax: +44 (0) 20 7240 8830 Email: [intelec@iee.org.uk](mailto:intelec@iee.org.uk)

Further details about INTELEC 2001 and requirements for contributions can be found at the conference website given above.

Direct media enquiries to:

Helen Pope  
IEE Media & Public Relations  
Tel: +44 (0)20 7344 8405  
Email: [hpope@iee.org.uk](mailto:hpope@iee.org.uk)

## Meetings of Interest to PELS Members

**APEC® 2001, the 16<sup>th</sup> Annual IEEE Applied Power Electronics Conference**, sponsored by the IEEE Power Electronics Society, the IEEE Industry Applications Society, and the Power Sources Manufacturers Association, will be held at the Disneyland Hotel, Los Angeles, CA, USA, March 4–8, 2001. See <http://www.apec-conf.org> and the related article in this *Newsletter* for details.

**E=TeM<sup>2</sup>** is scheduled March 14–16, 2001 in Liege, Belgium. TeM<sup>2</sup> is sponsored by the European Power Electronics Association, in cooperation with IEEE PELS. The theme of this discussion-oriented conference is tomorrow's education in electrical engineering. For further information see "conferences" at <http://www.epe-association.org> or email [E-TeM2@vub.ac.be](mailto:E-TeM2@vub.ac.be) or TEL +32 2 629 28 20.

**ISPSD'01, the 13th International Symposium on Power Semiconductor Devices & ICs**, will be held June 4–7, 2001 in Osaka, Japan. ISPSD'01 is sponsored by The Institute of Electrical Engineers of Japan, and co-sponsored by the IEEE Electron Devices Society. For more information visit <http://www.rdd.kepco.co.jp/ispsd/>.

**PESC® 2001, the 32<sup>nd</sup> Annual IEEE Power Electronics Specialists Conference**, will be held June 17–22, 2001 at the University of British Columbia in Vancouver, Canada. PESC is sponsored exclusively by the IEEE Power Electronics Society. For additional information see the related article in this *Newsletter* and visit <http://www.conferences.ubc.ca/pesc2001>.

**IEMDC 2001, the 3<sup>rd</sup> IEEE International Electric Machines & Drives Conference**, will be held June 17–20, 2001 at Massachusetts Institute of Technology in Cambridge, MA, USA. IEMDC is jointly sponsored by MIT and the IEEE Power Engineering, Industry Applications, and Power Electronics Societies. For more information contact Professor James L. Kirtley, Jr. at [kirtley@mit.edu](mailto:kirtley@mit.edu) or visit <http://wer.mit.edu/IEMDC>.

**The Summer Meeting of the IEEE Power Engineering Society** will be held July 15–19, 2001 at the Hotel Vancouver in Vancouver, BC, Canada. Visit the website <http://www.ieee-spm2001.org> or contact [yakout.mansour@bchydro.bc.ca](mailto:yakout.mansour@bchydro.bc.ca) for further information.

**TENCON 2001, the IEEE Region**

**10 International Conference on Electrical & Electronic Technology**, will be held August 19–22, 2001 on the SuperStar Virgo Cruise departing from Singapore. For details see <http://www.ieee.org.sg/tencon2001/>.

**EPE 2001, the 9<sup>th</sup> European Power Electronics Conference**, will be held at Grazer Congress Center in Graz, Austria on August 27–29, 2001. For complete information, see <http://epe2001.unileoben.ac.at>.

**INTELEC® 2001, the 23<sup>rd</sup> International Telecommunications Energy Conference**, is set for October 14–18, 2001 in Edinburgh, Scotland. Abstracts are due February 19, 2001, as noted in the Call for Papers on page 11 of this *Newsletter*. Visit <http://www.intelec.org> for additional information.

**PEDS'01, the International Conference on Power Electronics and Drives Systems**, is planned for October 22–25, 2001 in Bali, Indonesia. PEDS '01 is held in technical cooperation with the IEEE Industry Applications and Power Electronics Societies. Abstracts are due March 31, 2001. For further information see <http://www.ieeepeds.org> or contact Yanuarsyah Haroen at [yanuar@elga.net.id](mailto:yanuar@elga.net.id).

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