TRANSFORMERS COMMITTEE

January 29, 2010

Dear Committee Members and Guests:

Welcome to the Energy Capital of the World - Houston, Texas! You and a guest are cordially invited to attend the Spring 2010 Meeting of the IEEE/PES Transformers Committee, to be held March 7-11. It is my pleasure, and the sincere pleasure of Tulstar Products, Inc., to be your host for the event.

The meeting will be held at the Omni Houston Hotel, located at Four Riverway, Houston, Texas (www.omnihouston.com). The hotel is located on the west side of Houston, in the prestigious Uptown Post Oak area, approximately 10 minutes from downtown, and minutes away from the world-famous Galleria Shopping District. The group rate for guest rooms at the Omni Hotel is US$139/night (single or double occupancy), with rooms reserved under the group name "IEEE Transformers". Please contact the hotel directly for room reservations +713.871.8181 (or toll-free within the USA and Canada at 1.888.444.OMNI) and mention our group name.

HOUSTON INFORMATION

With a population of over 2.2 million people, Houston is the 4th largest city in the USA, behind New York, Los Angeles, and Chicago. Alive with energy and rich in diversity, Houston is a dynamic mix of imagination, talent, and first-class attractions that make it a world-class city. If you are interested in enjoying your own time outside of conference activities, I encourage you to go online to www.houstontx.gov/visitors for more information.

Houston is known for its fine dining establishments - whether your venue preference be Mexican, Cajun, Texas Barbeque, Steaks, Asian, Mediterranean, or Italian. This city will surely satisfy your appetite!

GETTING TO/FROM THE HOTEL

The Omni Hotel is located 30 miles from George Bush Intercontinental Airport (IAH), and 25 miles from Houston Hobby Airport (HOU).

A one-way Yellow Cab taxi cost ~$55 to/from Intercontinental Airport, and ~$45 to/from Hobby.

Super Shuttle (+713.523.8888 or 1.800.258.3826) is $18-24 one-way to/from either Intercontinental or Hobby. Be aware that Super Shuttle can make several stops along the way.

Karr Limousine has offered our group a fixed-rate, one-way fare to/from either Intercontinental Airport or Hobby Airport for $75 in a Town Car (2-3 passengers), or $120 in an SUV (4-5 passengers). This fixed rate includes taxes & tolls, AND driver gratuity. At least a 24-hour advanced reservation is necessary. Call +713.780.8300 or 1.800.406.1459, or email belinda@karrlimousine.com Mention the group name "IEEE".

ON-LINE REGISTRATION

Our week in Houston will be packed full of events to give you the opportunity to enjoy true Texas hospitality. On-line registration can be accessed at www.transformerscommittee.org and will offer you the opportunity to register for all special events, companion tours, and technical tours.

SPECIAL EVENTS

Sunday, March 7, NASA Space Center Tour
Houston is proud to be home to NASA's Johnson Space Center. Our day will include a tram tour of Mission Control, exhibits, lunch, and learning shows. Lunch vouchers will be provided to all attendees, and guests will enjoy a full day of learning and fun.

Sunday March 7, Evening Reception, Omni Hotel Ballroom
Nynas USA Inc. is proud to sponsor this renewal of friendships and formation of new acquaintances. A cash-bar and complimentary hor d'oeuvres will be provided.

Monday Evening, March 8
We have purchased a few tickets for the annual Houston Livestock Show and Rodeo, featuring a one of a kind livestock show and rodeo performance, great food, a carnival, and a concert by the Grammy Award-Winning Country Artist **TIM MCGRAW**. Don't wait to sign up for this event, tickets are limited. More event information is available at www.hlsr.com

Tuesday Speaker Luncheon
Houston is the home of Jim "Mattress Mack" McIngvale. Mack will present a topic that hits very close to home, "Overcoming Adversity". Mack is a Texas-grown phenomenon, with the ability to light up the audience using his great personality and motivational attitude. You will not want to miss this event!

Wednesday Evening Social
Join us for a "two-stepping" good time, food, and entertainment at Goode's Armadillo Palace. The Palace makes some of the best Texas BBQ and pecan pies that you have ever tasted. You will consider yourself a true Texan once you have had the opportunity to ride the mechanical bull, take photos with a live Texas Longhorn, dance to a live country music band, play pool, and shuffle board.

SPOUSE/COMPANION TOURS

Monday, March 8
Houston Museum Guided Tours with lunch in Rice Village. You will have an opportunity to visit the Houston Museum of Natural Science in Houston's beautiful Museum District, break for hosted lunch in Rice Village, then return for a tour of the Museum of Fine Arts, recognized as one of the Southwest's largest museums, with over 37,000 works of art.

Tuesday, March 9
Bayou Bend Tour with stop at the former home of philanthropist Ima Hogg, followed by three-course lunch at Houston's famous Post Oak Grill. During the Bayou Bend tour, you will be able to see the beautiful River Oaks District of Houston, featuring some of the most lavish houses and neighborhoods in the South. Guests will hopefully enjoy seeing Azalea gardens in full bloom.

TECHNICAL TOURS

Tuesday, March 9
Three (3) separate technical tours are offered this evening (each depart the hotel at 6:30 pm):

- Weidmann Diagnostic Testing Laboratory. Everyone is invited.
- ABB Marine Facility. Attendance limited to Committee Members and Active Participants.
- Huntsman Advanced Technology Center. Restricted attendance; by invitation only.

Thursday Evening, March 11
Finish your week in Houston with the best seafood buffet in Texas at Brady's Landing, while learning about the manufacture of transformer oil, and how the oil & refining market impacts transformer oil supply and demand. Immediately following lunch, we will take a 90-minute boat ride with guided tour of the Houston Ship Channel, to give our guests a full perspective of the energy and chemical business in Houston. This event is limited to the first 45 guests to register.

HOUSTON WEATHER

March is a tricky time of year to predict the Houston weather. The average high temperature in March is 74°F (23°C), with an average low of 55°F (13°C) ... BUT, this can vary depending upon weather patterns. Please check the forecast before your arrival and bring comfortable clothes, especially if you intend on joining some of the social events and technical tours.

ADDITIONAL INFORMATION

Along with this invitation letter, all meeting information can be downloaded from the Committee's website at www.transformerscommittee.org

1. Meeting Registration Form. This document is primarily used for those who do not have access to the Internet or need to pay by paper check or money order. It also makes a good guide to review the fees before you begin the on-line registration process. On-line registration is strongly encouraged.

2. Detailed Meeting Schedule & General Session Agenda. An updated schedule will be posted on the Committee's web site approximately one week prior to the meeting.

3. Information Flyers.
   - Sunday NASA Tour
   - Spouse/Companion Tours
   - Monday Rodeo Event
   - Wednesday Evening Dinner Social
   - Monday/Tuesday Technical Presentations
   - Technical Tours

We look forward to seeing you in Houston!

Jeremy Kriska
Director of Sales & Marketing, Tulstar Products, Inc.
Host, Spring 2010 Transformers Committee Meeting
jkriska@tulstar.com

Register on-line for the meeting using a credit card at: www.transformerscommittee.org (preferred method).
Use this form only if you do not have access to the Internet, or need to pay by check or money order.

IEEE/PES TRANSFORMERS COMMITTEE
Spring 2010 Meeting; March 7-11
Houston, Texas USA

Name of Attendee _____

Company / Institution _____

Street Address _____

City _____ State / Prov. _____ Postal Code _____ Country _____

Telephone _____ Email _____

PES Member? ☐Yes ☐No IEEE Standards Association Member? ☐Yes ☐No IEEE Membership #: _____

Will a companion accompany you? ☐Yes ☐No Full name of companion (for nametag) _____

Indicate if vegetarian meal(s) are required for: Attendee: ☐Yes ☐No Companion: ☐Yes ☐No

Other special requirements (special diets, wheelchair, etc.): _____

Attendee Registration Fee Includes: Entry into Meeting Area, Sunday Reception, coffee breaks, and 4 breakfasts (M, T, W, Th)
Spouse/Companion Registration Fee Includes: Sunday Reception and 4 breakfasts (M, T, W, Th)

-- Refund provided **ONLY** if the request is received **by March 3** (by confirmed email, see below) --

-- There is a US$25.00 service charge for a refund of the entire registration (US$10 for a partial refund) --

NOTE: Complete meeting registration (with fees) is necessary to attend ANY social event or tour

Meeting Registration Fees (all fees in US$ funds)	**On or Before February 12**	**After February 12, on or before March 3**	**On-site, at the Meeting**	**Total**
Attendee - IEEE Member (will be verified with IEEE)	$200	$250	$350	
Attendee - not IEEE member	$225	$275	$375	
Attendee - IEEE Life or Committee Emeritus (will be verified)	$50	$100	$200	
Spouse or Companion, and children age 10 and over	$75	$125	$225	

Note: A Companion is a "significant other", boy/girl friend, attending for non-commercial reasons (not attending technical meetings, etc.). Spouses/companions & children must be registered for the meeting (with above fees) to attend any tour or social event.

Sunday Evening Reception (event included in above fee) Attendee: ☐Yes ☐No; Companion: ☐Yes ☐No **-0-**

Monday Standards Luncheon: all SC/WG/TF leaders are encouraged to attend # ____ @ $20 _____

Tuesday Luncheon: Speaker - Jim "Mattress Mack" McIngvale # ____ @ $30 _____
Indicate selection for Tuesday Luncheon: Beef ____, Chicken ____, Vegetarian ____

Spouse/Companion Tours: Monday - Houston City and Museum District, with lunch # ____ @ $65 _____
Tuesday - Bayou Bend Collection & Gardens Tour, with lunch # ____ @ $65 _____

Social Events: Sunday - Day-trip to NASA, with lunch # ____ @ $40 _____
Monday - Houston Livestock Show & Rodeo, with concert # ____ @ $40 _____
Wednesday - Evening Dinner Social at Goode's Armadillo Palace # ____ @ $65 _____

Technical Tours: Tuesday - Weidmann Diagnostics Laboratory, everyone invited # ____ @ $0 _____
Tuesday - ABB Marine/Azipod Facility, limited attendance ** # ____ @ $0 _____
Thursday - Tulstar Ship Channel Tour and Lunch & Learn, everyone invited # ____ @ $0 _____

** - open only to regular meeting attendees (Committee Members & Active Participants)

Note: Meeting Minutes in paper format is no longer available. The primary source for Meeting Minutes is downloads from the Committee's web-site.

TOTAL REMITTED -- US$ _____

METHODS OF PAYMENT: 1. Register on-line with a credit card (preferred). 2. Mail paper form with check or money order to:
IEEE Transformers Committee; 13110 Birch Drive, Suite 148, PMB 330; Omaha, Nebraska 68164 USA
email: transformers@ieee.org. Cancellation by email is not considered accepted unless confirmed by return email.

Check or money order - Make payable to: **"IEEE Transformers Committee"**
Funds not from a US Bank must add US$25.00 for processing fee.

Mailed registrations without proper payment will not be accepted.

US Tax ID No. 13-1656633, Canadian Business No. 12563 4188, Euro Tax Registration No. EU826000081

IEEE/PES TRANSFORMERS COMMITTEE

www.transformerscommittee.org
Spring 2010 Meeting; March 7-11
Hosted by Jeremy Kriska and Tulstar Products, Inc.
Omni Houston Hotel; Houston, Texas USA

NOTES: See Page 5 for a key to abbreviations. A vertical line in the left margin indicates a noteworthy revision since last revision.

DATE/TIME	ACTIVITY	SUB-COM	ACTIVITY CHAIR	ROOM CAP/ARR/AV	MEETING ROOM (Floor)
Saturday, March 6					
	No Meeting Registration, No Social Events				
9:00 am - 5:00 pm >	Joint WG HVDC Bushings IEC/IEEE 65700-19-03			24 CL	Windsor
Sunday, March 7					
> 9:00 am - 12:00 pm	Joint WG HVDC Bushings IEC/IEEE 65700-19-03			24 CL	Windsor
9:00 am - 4:00 pm	Day Tour: NASA Space Center -- Indicate your desire to attend while registering on-line for the Committee Meeting. -- Bus will depart the Omni at 9:00 am and return around 4:00 pm. Eat breakfast before boarding bus. -- Arrangements will be made to return certain individuals to the hotel by 1:30 pm if necessary.				
1:00 pm - 5:30 pm	Meeting Registration				Regency Foyer
2:00 pm - 5:30 pm	Administrative SC -- closed meeting, by invitation only	Admin.	E. Smith	24 US (w/snack buffet)	Essex
2:00 pm - 5:30 pm	NEMA Transformers -- closed meeting, by invitation only	++	C. Drexler	16 US (w/beverages)	Windsor
6:00 pm - 8:00 pm	Welcome Reception (reception hosted by Nynas USA)			375 Reception	Regency Ballroom
Monday, March 8 -- Monday Breaks Sponsored by Dynamic Ratings ***					
7:00 am - 4:00 pm	Meeting Registration (staff for on-site registration provided by Nynas USA)				Regency Foyer
7:00 am - 6:00 pm	Internet Cafe'			12 SQ	Bristol
7:00 am - 7:50 am	Newcomers Orientation Breakfast Mtg (arrive early!) -- Newcomers & Guests are encouraged to attend! -- food will be served in the room		B. Chiu	40 CL	Westbury
7:00 am - 7:45 am	Distribution SC Leaders Coordination -- closed meeting, by invitation only		S. Shull	12 CONF	Noe Private Dining Room
7:00 am - 8:00 am	Breakfast - Attendees (no spouses/companions please)			250 RT (8/tbl)	Grand Salon
8:00 am - 9:00 am	Breakfast - Spouses/Companions (no meeting attendees please)			72 RT (8/tbl)	Palm Court
9:15 am - 3:30 pm	Spouses/Companions Tour: "Houston City & Medical Center Tour and Butterfly Center". Includes lunch. -- Advance registration required. Bus departs the Omni Hotel at 9:15 am and returns around 3:30 pm.				
8:15 am - 10:45 am	IEC TC-14 Technical Advisory Group (all interested individuals welcome)	++	P. Hopkinson	40 CL 20 TH (wall)	Westbury
8:00 am - 9:15 am	WG Dry-Type Reactors C57.16	Dry	R. Dudley	48 CL	Regency C
8:00 am - 9:15 am	WG 3-ph Underground Distribution Transformers C57.12.24	UTNP	G. Termini	48 CL	Regency G
8:00 am - 9:15 am	TF Particle Count **(New!)**	IF	M. Scarborough	80 CL	Regency AB
8:00 am - 9:15 am	TF DPV Grid Transformers	Power	H. Shertukde	80 CL	Regency EF
8:00 am - 9:15 am	TF Electrical Partial Discharge Measurements Guide C57.113	DiTests	E. Lemke	100 CL S3	Regency D
8:00 am - 9:15 am	WG Loss Evaluation Guide C57.120	PCS	A. Traut/ D. Duckett	150 CL S3	Colonnade AB
9:15 am - 9:30 am	*Break (beverages only)*			Regency Foyer	

*** Contact Joe Watson (joe_watson@ieee.org) if you are interested in sponsoring coffee-breaks at a future meeting.

DATE/TIME	ACTIVITY	SUB-COM	ACTIVITY CHAIR	ROOM CAP/ARR/AV	MEETING ROOM
Monday, March 8 (continued)					
	~~WG Revision of C57.12.10~~	Will not meet. Ballot resolution process.			
9:30 am - 10:45 am	WG Sealed Dry-Type Power Transf. C57.12.52	Dry	S. Kennedy	48 CL	Regency C
9:30 am - 10:45 am	WG Liquid-immersed Secondary Network Transformers C57.12.40	UTNP	B. Klaponski	48 CL	Regency G
9:30 am - 10:45 am	WG Overhead Distribution Transformers C57.12.20	Dist	A. Traut/ C. Simmons	80 CL	Regency AB
9:30 am - 10:45 am	TF Furan Tests	IL	TBD	80 CL	Regency EF
9:30 am - 10:45 am	TF External Dielectric Clearances	DiTests	E. Davis	100 CL S3	Regency D
9:30 am - 10:45 am	WG PCS Rev. to Test Code C57.12.90	PCS	M. Perkins	150 CL S3	Colonnade AB
10:45 am - 11:00 am	*Break (beverages only)*			Regency Foyer	
	~~WG Control Cabinets PC57.148~~	Will not meet. Ballot resolution process.			
11:00 am - 12:15 pm	WG Dry-Type Gen. Require. C57.12.01	Dry	T. Holdway	48 CL	Regency C
11:00 am - 12:15 pm	WG Std Requires for Sec. Network Protectors C57.12.44	UTNP	B. Wimmers	48 CL	Regency G
11:00 am - 12:15 pm	WG 1-ph Padmount Distribution Transformers C57.12.38 (12.21 & 12.25)	Dist	A. Ghafourian/ M. Faulkenberry	80 CL	Regency AB
11:00 am - 12:15 pm	TF Transf. Tank Rupture & Mitigation	Power	P. Zhao	80 CL	Regency EF
11:00 am - 12:15 pm	TF IEEE-IEC Cross Reference	Stds	J. Sim	100 CL S3	Regency D
11:00 am - 12:15 pm	WG Thermal Evaluation C57.100	IL	R. Wicks	150 CL S3	Colonnade AB
12:15 pm - 1:30 pm	Lunch Meeting: Standards Development Review -- All SC/WG/TF leaders are encouraged to attend. -- Advance reservation required ($20 for box lunch). -- No paper tickets. Admission verified at the door.		B. Bartley	120 (8/tbl)	Grand Salon
	~~WG 3-ph Padmount Distrib. C57.12.34~~	Document is approved. Will meet again in the fall.			
1:45 pm - 3:00 pm	**SC HVDC Converter Transformers and Smoothing Reactors**	HVDC	R. Dudley	48 CL	Regency C
1:45 pm - 3:00 pm	WG Tap Changer Performance C57.131	Power	W. Henning	48 CL	Regency G
1:45 pm - 3:00 pm	WG Dist. Transf. Bar Coding C57.12.35	Dist	L. Matthews	80 CL	Regency AB
1:45 pm - 3:00 pm	TF Special Dielectric Test Issues	DiTests	B. Forsyth	80 CL	Regency EF
1:45 pm - 3:00 pm	WG High Temp. Transformers PC57.154	IL	R. Marek	100 CL S3	Regency D
1:45 pm - 3:00 pm	WG Frequency Response Analysis (FRA) Guide PC57.149	PCS	C. Sweetser	150 CL S3	Colonnade AB
3:00 pm - 3:15 pm	*Break (beverages and treats)*			Regency Foyer	
3:15 pm - 4:30 pm	WG Dry-Type Test Code C57.12.91	Dry	D. Foster	48 CL	Regency C
3:15 pm - 4:30 pm	WG Harmonizing IEEE & IEC Standards	Stds	J. Puri	48 CL	Regency G
3:15 pm - 4:30 pm	WG Transformer Paralleling Guide	Power	T. Jauch	80 CL	Regency AB
3:15 pm - 4:30 pm	TF PD in Bushings and PTs/CTs	DiTests	T. Hochanh	80 CL	Regency EF
3:15 pm - 4:30 pm	TF Moisture in Oil	IF	B. Rasor	100 CL S3	Regency D
3:15 pm - 4:30 pm	WG PCS Revisions to C57.12.00	PCS	S. Snyder	150 CL S3	Colonnade AB
4:30 pm - 4:45 pm	*Break (beverages only)*			Regency Foyer	
4:45 pm - 6:00 pm	Presentation: "Geo-magnetically Induced Currents (GIC) and the Effects on Power Transformers", by P. Balma, L. Buldoc, R. Girgis, and H. Nordman. Sponsored by SC Power Transformers **			250 S3 (add 100 TH seats)	Colonnade AB
6:15 pm - 12:00 am	Social Event: "A Night at the Houston Livestock Show and Rodeo", with Tim McGraw concert. -- Rodeo starts at 6:45 pm. Concert starts ~9:00 pm. -- Advanced registration required. Indicate your desire to attend while registering for the Committee Meeting. -- Paper tickets can be collected at the Committee Meeting registration desk. -- Buses will depart the Omni Hotel at 6:15 pm and return around midnight.				

** Contact Greg Anderson (gwanderson@ieee.org) if you are interested in making a technical presentation at a future meeting.

DATE/TIME	ACTIVITY	SUB-COM	ACTIVITY CHAIR	ROOM CAP/ARR/AV	MEETING ROOM
Tuesday, March 9 -- Tuesday Breaks Sponsored by Weidmann * **					
7:00 am - 12:00 pm	Meeting Registration (staff for on-site registration provided by Nynas USA)				Regency Foyer
7:00 am - 6:00 pm	Internet Cafe'			12 SQ	Bristol
7:00 am - 8:00 am	Breakfast - Attendees (no spouses/companions please)			250 RT (8/tbl)	Grand Salon (lobby level)
8:00 am - 9:00 am	Breakfast - Spouses/Companions (no meeting attendees please)			72 RT (8/tbl)	Palm Court
9:15 am - 2:30 pm	Spouses/Companions Tour: "Bayou Bend and Gardens Tour". Includes lunch. -- Advance registration required. Bus departs the Omni Hotel at 9:15 am and returns around 2:30 pm.				
	~~WG Switching Transients PC57.142~~	Document recirculation is complete; will meet in fall.			
8:00 am - 9:15 am	TF Milli-ampere Current Transf. **(New!)**	IT	Alton/Nguyen	48 CL	Regency C
8:00 am - 9:15 am	WG PC57.152 Field Test Guide	Stds	J. Verner	48 CL	Regency G
8:00 am - 9:15 am	WG Enclosure Integrity C57.12.28, C57.12.29, C57.12.31, C57.12.32	Dist	R. Olen/ D. Mulkey	80 CL	Regency AB
8:00 am - 9:15 am	TF Wind Power Transformers **(New!)**	Power	D. Buckmaster	80 CL	Regency EF
8:00 am - 9:15 am	WG Oil Reclamation Guide PC57.637	IF	J. Thompson	100 CL S3	Regency D
8:00 am - 9:15 am	TF Temperature Limits for Non-current Carrying Metallic Surfaces	IL	J. Ray	150 CL S3	Colonnade AB
9:15 am - 9:30 am	*Break (beverages only)*			Regency Foyer	
9:30 am - 10:45 am	WG Neutral Ground. Devices PC57.32	PCS	S. Schappell	48 CL	Regency C
9:30 am - 10:45 am	WG Terminal Markings C57.12.70	Stds	S. Shull	48 CL	Regency G
9:30 am - 10:45 am	TF Functional Life Tests, De-energized Tap Changers (DETC)	Power	P. Hopkinson	80 CL	Regency AB
9:30 am - 10:45 am	WG Impulse Test Guide C57.98/138	DiTests	A. Molden	80 CL	Regency EF
9:30 am - 10:45 am	TF DGA Natural Ester Fluids	IF	P. Boman	100 CL S3	Regency D
9:30 am - 10:45 am	WG Revision to Loading Guide C57.91	IL	D. Duckett	150 CL S3	Colonnade AB
10:45 am - 11:00 am	*Break (beverages only)*			Regency Foyer	
	~~WG Voltage Step Regulators C57.15~~	Document published in December. Will meet in the fall.			
11:00 am - 12:15 pm	WG Revision to IEEE 638	Power	C. Swinderman	48 CL	Regency C
11:00 am - 12:15 pm	WG Bushing Application Guide C57.19.100	Bush	T. Spitzer	48 CL	Regency G
11:00 am - 12:15 pm	TF Tank Pressure Coordination **(New!)**	Dist	C. Gaytan	80 CL	Regency AB
11:00 am - 12:15 pm	TF Tertiary/Stabilization Windings	PCS	E. Betancourt	80 CL	Regency EF
11:00 am - 12:15 pm	WG Guide for DGA in LTCs C57.139	IF	F. Jakob	100 CL S3	Regency D
11:00 am - 12:15 pm	WG Temperature Rise Test Procedures in Section 11 of C57.12.90	IL	P. Powell	150 CL S3	Colonnade AB
12:15 pm - 1:30 pm	Speaker Luncheon: Jim "Mattress Mack" McIngvale -- Topic: "Overcoming Adversity ". Advance registration is necessary. -- Paper tickets are not provided. Admission verified at the door.			240 (8/tbl) with elevated table for 5	Grand Salon
1:45 pm - 3:00 pm	WG Phase-shift Transf. Guide C57.135	Power	J. Sim	48 CL	Regency C
1:45 pm - 3:00 pm	WG Dry-type Loading Guide PC57.96 (**New!**)	Dry	R. Marek	48 CL	Regency G
1:45 pm - 3:00 pm	TF Transformer Efficiency and Loss Evaluation (DOE Activity)	Dist	P. Hopkinson	80 CL	Regency AB
1:45 pm - 3:00 pm	TF GSU Bushing Standardization	Bush	C. Hurley	80 CL	Regency EF
1:45 pm - 3:00 pm	WG Revision to Gas Guide C57.104	IF	R. Ladroga	100 CL S3	Regency D
1:45 pm - 3:00 pm	WG Revision to Low Frequency Tests	DiTests	B. Poulin	150 CL S3	Colonnade AB
3:00 pm - 3:15 pm	*Break (beverages and treats)*			Regency Foyer	

*** Contact Joe Watson (joe_watson@ieee.org) if you are interested in sponsoring coffee-breaks at a future meeting.

DATE/TIME	ACTIVITY	SUB-COM	ACTIVITY CHAIR	ROOM CAP/ARR/AV	MEETING ROOM
Tuesday, March 9 (continued)			Work		
3:15 pm - 4:30 pm	TF Semiconductor Rectifier Transformers C57.18.10	PCS	S. Kennedy	48 CL	Regency C
3:15 pm - 4:30 pm	WG Electronic Test Data Reporting C57.12.37	Dist	J. Crotty	48 CL	Regency G
3:15 pm - 4:30 pm	TF ASV Revision to Test Code C57.12.90	ASV	R. Girgis	80 CL	Regency AB
3:15 pm - 4:30 pm	WG Revisions to Impulse Test Sections of C57.12.00 and C57.12.90	DiTests	P. Riffon/ P. Heinzig	80 CL	Regency EF
3:15 pm - 4:30 pm	TF Field Application of Natural Ester Fluids	IF	J. Graham	100 CL S3	Regency D
3:15 pm - 4:30 pm	WG Transportation Issues Guide	Power	G. Anderson	150 CL S3	Colonnade AB
4:30 pm - 4:45 pm	*Break (beverages only)*			Regency Foyer	
4:45 pm - 6:00 pm	Presentation: "Transformer Tank Rupture and Mitigation", by W. Darovny, M. Foata, J. Herz, W. Johnson, C. Swinderman, and P. Zhao. Sponsored by Power Transformers SC **			250 S3 (add 100 TH seats)	Colonnade AB
6:30 pm - 10:00 pm	Technical Tour: Weidmann Diagnostic Testing Laboratory. Everyone is invited. -- Indicate your desire to attend while registering on-line for the Committee Meeting. -- Bus will depart the Omni at 6:30 pm and return around 10:00 pm. Dinner will be served at the facility. -- For more details, contact Tom Prevost at +802.751.3458 or <tom.prevost@wicor.com>.				
6:30 pm - 10:00 pm	Technical Tour: ABB Marine Services and Azipod Workshop -- Attendance limited to Committee Members and Active Participants. -- Indicate your desire to attend while registering on-line for the Committee Meeting. -- Bus will depart the Omni at 6:30 pm and return around 10:00 pm. Dinner will be served at the facility. -- Contact Craig Muirhead at +713.453.1253, ext. 102 or <craig.muirhead@us.abb.com> for more details.				
6:30 pm - 10:00 pm	Technical Tour: Huntsman Advanced Technology Center (HATC). -- Restricted attendance; by invitation only (Huntsman will send invitations separately) -- Bus will depart the Omni at 6:30 pm and return around 10:00 pm. Dinner will be served at HATC. -- For more details, contact Dawn Adair at +281.719.4490 or <dawn_adair@huntsman.com>.				
Wednesday, March 10 -- Wednesday Breaks Sponsored by AREVA T&D * **					
	No Meeting Registration, No Technical Tours, No Spouse/Companion Tour				
7:00 am - 6:00 pm	Internet Cafe'			12 SQ	Bristol
7:00 am - 8:00 am	Breakfast - Attendees (no spouses/companions please)			200 RT (8/tbl)	Grand Salon
8:00 am - 9:30 am	Breakfast - Spouses/Companions (no meeting attendees please)			72 RT (8/tbl)	Palm Court
7:00 am - 7:45 am	**SC Meetings Planning** -- breakfast buffet in room	Meetings	G. Anderson	30 CL	Essex
8:00 am - 9:15 am	EL&P Delegation (Users only meeting)	++	S. Shull	50 CL	Regency BC
8:00 am - 10:45 am	**SC Instrument Transformers**	IT	J. Smith	30 CL	Essex
8:00 am - 9:15 am	**SC Insulation Life**	IL	B. Forsyth	200 CL S3	Colonnade AB
9:15 am - 9:30 am	*Break (beverages only)*			Regency Foyer	
9:30 am - 10:45 am	**SC Audible Sound & Vibration**	ASV	J. Puri	75 CL	Regency BC
9:30 am - 10:45 am	**SC Bushings**	Bush	F. Elliott	100 CL S3	Regency D
9:30 am - 10:45 am	**SC Distribution Transformers**	Dist	S. Shull	200 CL S3	Colonnade AB
10:45 am - 11:00 am	*Break (beverages only)*			Regency Foyer	
11:00 am - 12:15 pm	**SC UG Transf. & Network Protectors**	UTNP	C. Niemann	50 CL	Regency A
11:00 am - 12:15 pm	**SC Dielectric Tests**	DiTests	L. Wagenaar	200 CL S3	Colonnade AB
12:15 pm - 1:30 pm	Lunch (on your own)				

** Contact Greg Anderson (Greg Anderson) if you are interested in making a technical presentation at a future meeting.
*** Contact Joe Watson (joe_watson@ieee.org) if you are interested in sponsoring coffee-breaks at a future meeting.

KEY

Note: A PC projector will be furnished in each meeting room. Arrive early to ensure that equipment operates/syncs correctly. Overhead projectors are available in the meeting registration area.

> -- activity continued into another session / from another session
++ -- not a Transformers Committee activity TBD = "To Be Determined"
FC = flip chart; S1 = sound (see note)
S2 = stand mic in front only; S3 = one stand mic in front & stand mic(s) at mid-room
CL -- classroom seating (w/head table for 2-3)
TH -- theater seating (with head table for 2-3)
RT -- multiple roundtables (8-9/table)
US -- U-shape table

DATE/TIME	ACTIVITY	SUB-COM	ACTIVITY CHAIR	ROOM CAP/ARR/AV	MEETING ROOM
Wednesday, March 10 (continued)					
1:30 pm - 2:45 pm	**SC Dry Type**	Dry	C. Johnson	50 CL	Regency A
1:30 pm - 2:45 pm	**SC Power Transformers**	Power	T. Lundquist	200 CL S3	Colonnade AB
2:45 pm - 3:00 pm	*Break (beverages and treats)*			Regency Foyer	
3:00 pm - 4:15 pm	**SC Insulating Fluids**	IF	S. McNelly	75 CL	Regency BC
3:00 pm - 4:15 pm	**SC Performance Characteristics**	PCS	S. Antosz	200 CL S3	Colonnade AB
4:15 pm - 4:30 pm	*Break (beverages only)*			Regency Foyer	
4:30 pm - 5:30 pm	**SC Transformer Standards**	Stds	B. Bartley	200 CL S3	Colonnade AB
6:00 pm - 10:00 pm	Dinner Social: Goode's Armadillo Palace. Advance registration is necessary. -- Buses begin boarding at 5:45 pm. The last bus departs at 6:00 pm. All buses will return before 10:00 pm. -- Paper tickets will not be provided. Admission will be verified with a registration list as you board the bus.				
Thursday, March 11					
	No Meeting Registration, No Spouses/Companions Tours, No Internet Cafe', No EPRI Meeting				
7:00 am - 8:00 am	Breakfast - Attendees (no spouses/companions please)			200 RT (6/tbl)	Regency EFG
8:00 am - 9:30 am	Breakfast - Spouses/Companions (no meeting attendees please)			64 RT(8/tbl)	Palm Court
8:00 am - 9:45 am >	General Session, Transformers Committee -- All attendees are encouraged to attend. -- See separate document for meeting agenda.		E. Smith	250 CL S1 50 TH elevat. table for 4	Regency ABCD
9:45 am - 10:00 am	*Break (beverages only)*			Regency Foyer	
> 10:00 am - 11:30 am	General Session, Transformers Committee		E. Smith	250 CL S1 50 TH	Regency ABCD
12:00 pm - 5:00 pm	Technical Tour: Boat Tour of Houston Ship Channel Refineries & Chemical Plants. Hosted by Tulstar Products, Inc. Includes "lunch-and-learn" presentation on "The Manufacture of Transformer Fluids". -- Bus will depart the Omni at 12:00 pm and return before 5:00 pm. -- Indicate your desire to attend while registering on-line for the Committee Meeting. -- See flyer for additional security measures.				
Friday, March 12					
	No Transformer Committee Meetings, No Internet Cafe', No EPRI Meeting, No Tours.				

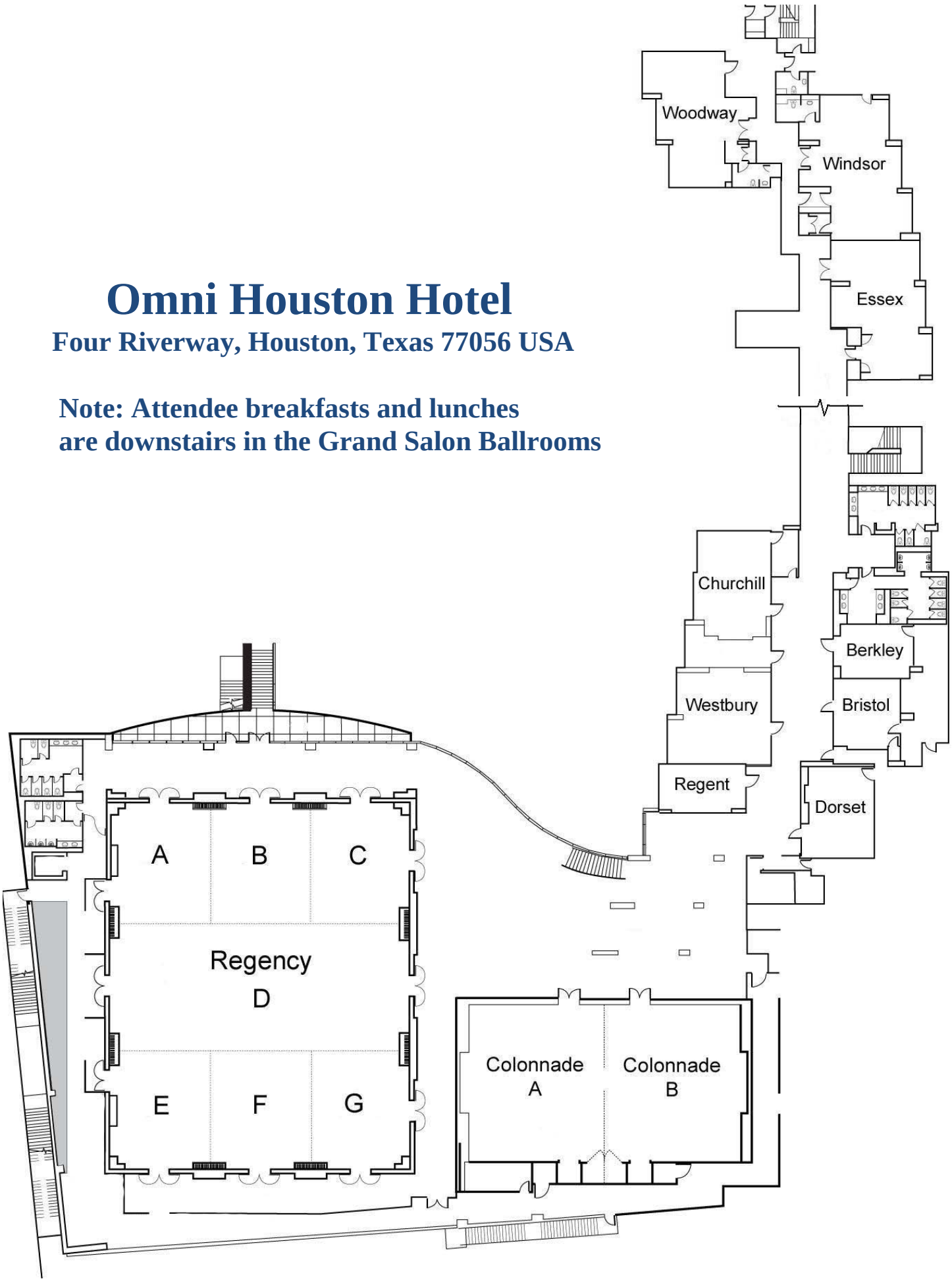
FUTURE COMMITTEE MEETINGS

FALL 2010 - October 24-29; Toronto, Ontario CANADA. Hosted by Trench Electric.
SPRING 2011 - March 10-14; San Diego, California USA. Hosted by San Diego Gas & Electric

Omni Houston Hotel

Four Riverway, Houston, Texas 77056 USA

Note: Attendee breakfasts and lunches are downstairs in the Grand Salon Ballrooms



IEEE/PES TRANSFORMERS COMMITTEE

General Session - Spring 2010 Meeting
Thursday, March 11

Chair: Ed Smith Vice Chair: Bill Chiu Secretary: Don Platts Treasurer: Greg Anderson

1.	Chair's Remarks and Announcements		J. Edward Smith
2.	Approval of Minutes from Fall 2009 Meeting		J. Edward Smith
3.	Administrative Subcommittee		J. Edward Smith
4.	Vice Chair's Report		Bill Chiu
5.	Treasurer's Report		Gregory W. Anderson
6.	Transformer Standards		William H. Bartley
7.	Recognition and Awards		Thomas A. Prevost
8.	New Business (continued below)		J. Edward Smith
9.	Report of Technical Subcommittees		
	9.1.	Insulation Life	Bruce I. Forsyth
	9.2.	Performance Characteristics	Stephen Antosz
	9.3.	Power Transformers	Thomas G. Lundquist
	9.4.	Underground Transformers & Network Protectors	Carl G. Niemann
	9.5.	Audible Sound and Vibration	Jeewan L. Puri
	9.6.	Bushings	Fred E. Elliott
	9.7.	Dry Type Transformers	Charles W. Johnson
	9.8.	Distribution Transformers	Stephen D. Shull
	9.9.	Dielectric Tests	Loren B. Wagenaar
	9.10.	HVDC Converter Transformers & Reactors	Richard F. Dudley
	9.11.	Instrument Transformers	James E. Smith
	9.12.	Insulating Fluids	Susan J. McNelly
10.	Editor's Report		Edward G. teNyenhuis
11.	Meetings Subcommittee		Gregory W. Anderson
12.	Reports of Liaison Representatives		
	12.1.	Standard Coordinating Committee No. 4	Paulette Payne Powell
	12.2.	IEC TC-14 Technical Advisor to USNC	Philip J. Hopkinson
	12.3.	CIGRE	Jean-Christophe Riboud
13.	Old Business		J. Edward Smith
14.	New Business (further discussion as needed)		J. Edward Smith

Sunday, March 7

Come join us at
Space Center Houston!

Buses will depart from the Omni Hotel at 9:00 am, and will head towards Space Center Houston, approximately a 45-minute drive.

The tour includes a TRAM tour to the Historic Mission Control Center, the Space Vehicle Mock Up Facility, the “all new” Saturn V Complex at Rocket Park, or the current Mission Control Center.

You may even be able to see astronauts training for upcoming missions!

Lunch tickets will be provided with the tour.

The tour will finish at approximately 3:00 pm, when buses will load and return back to the Omni Hotel by 4:00PM.

Note: If certain guests need to return by 1:30 pm for meetings, earlier transportation will be provided.

Monday Evening, March 8, 2010

GET READY HOUSTON VISITORS!!!
IT'S RODEO SEASON!!!

Buses will depart at 6:15 pm Monday to watch the Rodeo Performance at Reliant Arena, featuring a 2-hour rodeo performance followed by a concert at the adjacent Reliant Stadium by Grammy Award-Winning Country Artist ...

TIM MCGRAW!

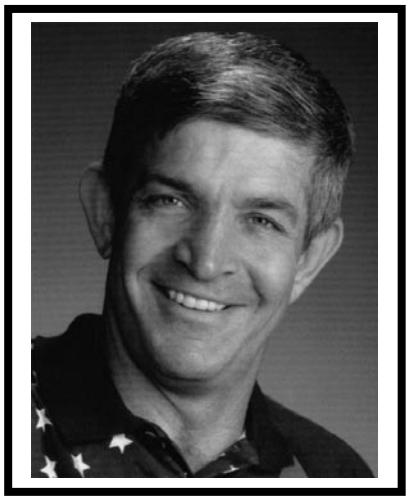
Don't miss this fun event, you will have the opportunity to watch the infamous bull riding performances, barrel racing, calf scramble, and chuck wagon races.

For dinner try some of the Rodeo's finest, from smoked turkey legs, BBQ , fried Oreos, fried Twinkies, YOU NAME IT! Dinner will be on your own and up to you, so be prepared to tempt your taste buds.

Tim McGraw's concert performance will begin at approximately 9:00 pm at Reliant Stadium, home of the Houston Texans NFL Football Team.

Buses will depart immediately following the concert and return around midnight.

SPECIAL NOTE: Due to insurance requirements, the buses that we are providing to the rodeo can only be used by attendees who registered for this event while registering on-line for the committee meeting. Also, the quality and locations of seats at the concert cannot be assured.



Tuesday, March 9
Speaker Luncheon

"OVERCOMING ADVERSITY"

GALLERY ★ FURNITURE

Jim "Mattress Mack" McIngvale

Jim "Mattress Mack" McIngvale is a Texas-grown phenomenon who knows how to "Save You Money, TODAY!"

In 1981, Mack and his wife Linda started Gallery Furniture with five thousand dollars and a dream. Mack began television advertising early on and with his motto of "Early to bed, early to rise, work like hell and advertise", he quickly became a household name.

In 2009, Gallery Furniture opened a second store on Post Oak Blvd in the Houston Galleria area. This proved to be a blessing as Mack, Linda, and the entire Gallery Furniture family faced a horrific fire on May 21, 2009 at the flagship Interstate 45 store location which destroyed the warehouse. By bringing their positive approach and "TODAY" philosophy to everything they do, Gallery Furniture was able to re-build the "World's Greatest Furniture Store" bigger and better than ever with a full Grand Opening on September 7, 2009.

The triumph of Gallery Furniture is mostly attributed to Mack's "do-whatever-it-takes" approach to pleasing the customer. With just 2 locations, Gallery Furniture sells the most furniture in the nation per square foot, including furniture and sleep sets from designers such as Tempur-Pedic, Mayo, United Leather, American Leather, Ty Pennington Collection by Howard Miller, Drexel Heritage, Kreiss, Berg Beds, and so much more.

Mack's strong work ethic is matched by his philanthropy and exceeded only by the commitment he has to his family. Past charitable contributions include:

- Annual Christmas give-away furnishing 30 households of furniture every year
- Furniture donations to hundreds of teacher lounges in Houston area schools
- Raising over $12 million to aid those affected by the Tsunami in Southeast Asia and Hurricane Katrina
- Underwriting the YMCA playground at Reliant Stadium for Katrina Evacuees
- Housing several hundred evacuees during hurricane crisis
- One of the largest contributors the Houston Livestock Show & Rodeo
- Furnishing George Bush Presidential Library at Texas A&M
- Donating racquets to inner city kids who otherwise would not have had an opportunity to take tennis lessons
- Sole sponsor of Pilgrimage of Faith sending 500 kids and chaperons from the Galveston/Houston to Rome
- Feeding 25,000 people Thanksgiving dinner for several years
- Purchasing 10,000 toys for needy children, distributed during the holidays
- Large annual contributions to Baylor College of Medicine and Harvard Medical School

In addition to Gallery Furniture, Mack and Linda also own and operate Westside Tennis and Fitness and enjoy spending time with their three children James, Laura and Elizabeth.

During Mack's speech, he will capture your attention with a subject he knows quite well ... **"Overcoming Adversity"**.

Lunch Menu Selections

Indicate your entrée selection when registering on-line for the meeting:

Beef: *Grilled Marinated Flat-Iron Steak with Chimichurri*
Chicken: *Grilled Breast of Chicken with Smoky Ancho Chili*
Vegetarian: *Vegetarian Lasagna*

Each selection is served with a classic Caesar salad, side vegetable and starch, freshly baked rolls & butter, dessert, and ice tea & coffee service.

Spouses/Companions Tour (Revised)
Monday, March 8, 2010
Houston City Tour, Medical Center Tour and Butterfly Center

HOUSTON CITY TOUR

You will sample the excitement of this truly international city. From the impressive downtown Theater District to the historic Rice University Campus, this bus tour highlights some of the green spaces and skyscrapers that coexist in downtown Houston.

CITY OF MEDICINE, THE TEXAS MEDICAL CENTER

The Texas Medical Center started with a dream to create a medical center, where people from all walks of life could have access to the best health care in the world. In a few short decades it has grown into one of the world's finest medical complexes. This bus tour will explore the Medical Center's 800+ acres by bus. This "City of Medicine" has produced several of the most remarkable achievements in medical history. It is where one of the first, and still the largest, air emergency service was created; a very successful inter-institutional transplant program was developed; and more heart surgeries than anywhere else in the world.

THE HOUSTON MUSEUM OF NATURAL SCIENCE

The Houston Museum of Natural Science is one of the most visited natural science museums in the South. Highlights include the Cullen Hall of Gems and Minerals which beautifully showcases 600 of the world's finest quality natural mineral specimens. In the newest addition to the Museum, the McGovern Hall of the Americas, discover life in the Americas before the arrival of the Spanish conquistadors. In the newest addition to the Museum, the McGovern Hall of the Americas, discover life in the Americas before the arrival of the Spanish conquistadors. The Life Through Time Paleontology Hall offers a chance to experience Prehistoric and Ice Age life through actual fossils, photomurals and displays.

COCKRELL BUTTERFLY CENTER

This three-story glass structure is adjacent to the main museum, home to thousands of exotic live butterflies, insects and plants, the Cockrell Butterfly Center is designed to be interactive, with the insects fluttering among and occasionally landing on visitors.

Itinerary:

9:15 am	Depart Omni Hotel
9:15 - 11:30	Guided bus tour of Houston City and The Texas Medical Center, with a photo-op stop at the Waterwall
11:30 - 1:00	Lunch, either at Mia Bella or Trevisio Restaurant
1:15 - 2:30	Museum of Natural Science (with optional guided tour)
2:30 - 3:15	Cockrell Butterfly Center
~3:30 pm	Return to Omni Hotel

Spouses/Companions Tour

Tuesday, March 8, 2010

Bayou Bend Tour

Bayou Bend is a sanctuary from the hustle and bustle of the nearby big city, and nestled on 14 rolling wood acres in the posh River Oaks area, this former home of local philanthropist Ima Hogg now serves as the decorative arts wing of the Museum of Fine Arts. Architect John Staub built Hogg's pink stucco dream home with the idea of "adding pleasure to living." His innovative design is carried through into the nine surrounding gardens. The Diana Garden which features "walls" of yaupon hedges is the best example of this concept.

The interior of the house burrows heavily from Northern architectural traditions. An ideal setting for Hogg's extensive collection of art and antiques, 28 room settings depict the changes in America's taste, style & customs from Colonial times to the Victorian era.

Miss Ima passed away in 1975, but art historians rank her collection of American silver, ceramics, furniture, paintings, and works on paper among the nations finest.

Following the Bayou Bend Tour, guests will enjoy a 3-course lunch at Post Oak Grill.

Itinerary:

9:15 am Depart Omni Hotel
9:30 am Guided tour of homes & gardens
12:00 pm Lunch at Post Oak Grill
~2:30 pm Return to Omni Hotel

Wednesday Evening Social
March 10, 2010

Got enough of Texas yet?
Hope you have your boots ready!

JOIN US AT GOODE'S ARMADILLO PALACE!

Buses will begin boarding at 5:45 pm for an evening of Entertainment and some of Texas's best BBQ. Don't miss Out on Goode's world renown Pecan Pies! And you must try some Shiner Bock Beer, brewed in the Lone Star State!

Take a ride on the mechanical bull – can you last 8 seconds?

Wear your Western wear! (optional, of course)
Take photos with a live Texas Longhorn.
Play shuffleboard, pool, or other fun games.

We'll have a live country band, and dance lessons for our guests.

The evening will finish after the last victim has been thrown from the bull, and buses will return to the Omni Hotel by 10:00 pm.

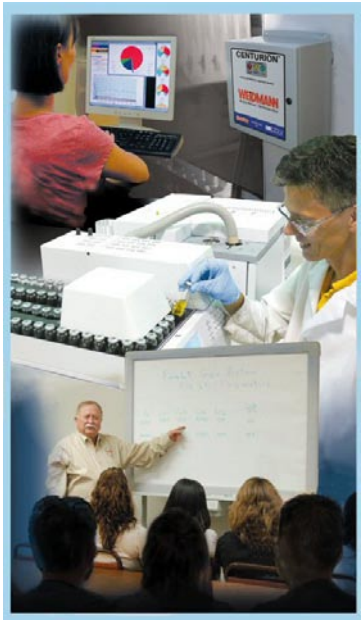
WEIDMANN

You are cordially invited to tour our Houston, Texas Diagnostic Testing Laboratory

Tuesday evening, March 9, 2010

As part of the Spring 2010 IEEE/PES Transformers Committee Meeting

WEIDMANN DIAGNOSTIC SOLUTIONS is a leading provider of laboratory and diagnostic services for the power industry. Our Houston Lab is one of twelve **WEIDMANN** Laboratories in North America. **WEIDMANN** Labs are staffed with qualified chemists, equipped with up-to-date analytical equipment and supported by engineering diagnostics.



The Houston Laboratory tour will introduce Committee Members to the analytical tests used to appraise transformer condition. A brief presentation on transformer diagnostics based on oil samples will be given following the tour. This presentation will include the role of IEEE standards in the diagnostics process.

Tour Schedule

6:30 pm: Bus departs the Omni Houston Hotel
7:00 pm: Laboratory Tour
7:30 pm: Dinner
8:30 pm: Presentation on Transformer Diagnostics, based on oil samples
9:00 pm: Depart for Omni Houston Hotel
10:00 pm: Arrive back at Hotel

Transportation will be provided. Spouses/companions are welcome. Indicate your desire to participate in this tour when you register on-line for the Committee Meeting.

No cameras are allowed on the tour. Please wear your IEEE name badge during the tour.
To reserve your place in the tour please indicate your desire to attend the tour when you register on-line for the IEEE Committee Meeting.

For more information or questions regarding the tour, contact Tom Prevost at tom.prevost@wicor.com or call 802-751-3458.

Pre-registration is required – seating is limited

ABB MARINE SERVICES

You are invited to attend an ABB event Tuesday, March 09th from 6.30 to 10.00pm, at our AZIPOD® Workshop Facility, Greens Port

As part of the Spring 2010 IEEE/PES Transformers Committee Meeting

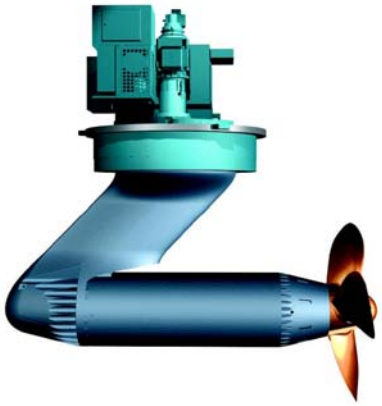


ABB Marine and Cranes is the leading supplier of Power Distribution, Drilling, Propulsion and Automation Systems to the Oil & Gas and Cruise & Ferry industries, with over 1100 employees in 21 countries, delivering a portfolio of products and services which includes the AZIPOD®, an electrically driven podded propulsion system rotating through 360'. This concept was first introduced in 1990 and has delivered paramount changes in the field of environmental operation, hydrodynamic efficiency & enhanced maneuverability.

The AZIPOD® Workshop Tour will introduce this product from a service perspective and feature both Compact (3MW) and Large (16MW) AZIPOD units currently being serviced in our 48,000 sq/ft workshop which contains two assembly pits, 100T Metric Craneage and HVAC controlled assembly and inspection areas. The presentation will also include an overview of all Marine Service systems and applications.

Schedule

6.30pm: Bus Departs Omni Hotel

7.00pm: Workshop Facilities Tour

8.15pm: Presentation of MARINE SERVICES and Dinner (boxed)

9.30pm: Bus Departs Workshop

10.00pm: est. arrival Omni Hotel

Transportation will be provided. Spouses/Companions are welcome. Please indicate a desire to attend this event through the registration for Committee Meeting. IEEE name badges must be worn during tour and no cameras are allowed inside main Workshop.

For more information or questions, please contact Craig Muirhead at (713) 587 8225 or email: craig.muirhead@us.abb.com. **Pre-Registration is Required for this Event.**

Thursday Afternoon, March 11

Sponsored by Tulstar Products, Inc.

Finish off the Transformers Committee Meeting with Tulstar by taking a guided boat tour of the Houston Ship Channel, featuring a memorable visual of one of the refining and chemical manufacturing capitals of the world.

The bus will depart at 12:00 pm noon sharp and will stop first at Brady's Landing Restaurant, one of Houston's finest seafood buffets. During lunch, you will have the opportunity to learn about the "Transformer Oil Manufacturing Process" along with external factors that affect the supply of this specialty oil.

Immediately following the lunch presentation, we will take a short bus ride to the boat, and begin our tour at 2:30 pm. The tour ends at 4:00 pm, and buses will return to the Omni Hotel around 5:00 pm.

A government-issued ID (valid passport or US state-issued drivers license) is necessary for admission on the boat tour.

Don't wait to reserve a seat for this event, as the boat is limited to only 50 guests.

IEEE/PES Transformers Committee
Spring 2010 Meeting
Houston, Texas USA

"GIC Currents and the Effects on Power Transformers"

-- Technical Presentation --
Monday, March 8, 2010

By Peter Balma, Leonard Bolduc, Ramsis Girgis, and Hasse Nordman

1. Abstract

Geo-magnetically Induced Currents (GIC) are the result of solar flares. They typically pass through to power transformers through the neutral. These currents can cause power transformer core saturation and harmful effects in the transformer depending on the magnitude of these currents and the design of the transformer.

These Solar storms typically occur in a cycle of about 11 to 12 years. The highest magnitude of such solar magnetic storms occurred in the Northeast of the USA on March 13, 1989. This storm caused the power system of a major utility to collapse for 8 hrs, one large power transformer at another utility to fail, and a number of other power transformers in the Northeast to experience overheating of structural parts / tanks; leading to abnormal gas generation.

This tutorial has three parts to it. First, the process of the generation of these currents will be explained. This will be followed by a presentation of the effect of these currents on power transformers. This part of the tutorial will include results of analytical investigations and measurements of the effect of GIC currents on power transformers. Finally, methods used today to monitor GIC currents and available means of minimizing the magnitude of their effect on transformers will be presented.

2. Learning Objectives

This tutorial is planned to:

- Provide background to how GIC currents are induced.
- Explain the possible harmful effects of GIC currents in power transformers.
- Present actual incidents of high magnitudes of GIC currents and their harmful effects
- Explain factors that influence the magnitude of the effect of GIC on power transformers
- Present methods used today by utilities to monitor, mitigate, and protect against the effects of GIC

3. Learning Outcomes

As a result of attending this tutorial session, members will gain an understanding of the following:

- How GIC currents are induced
- Factors affecting magnitudes of the GIC currents
- What the harmful effects of GIC currents in power transformers are.
- Factors affecting the magnitude of the effect of GIC currents in power transformers
- Presently used methods to monitor, mitigate, and protect against the effects of GIC

4. Presenters' Biographies

Dr. Peter M. Balma (M'74, SM'95) is a Principal Consultant providing services to electric utilities, consulting firms, and research organizations in the fields of power system analysis and transformer design & application. Before forming "Peter M Balma Engineering Consulting" in 2006, Peter was with PSE&G Company for 25 years. There he held various technical and management positions in the T&D departments of this utility. Dr. Balma has more than 28 years experience in the design, installation and operation of major electrical equipment in substations, switching stations, and generating stations; in the study of power systems; and in the design and application of large power transformers. He received his BSEE from New Jersey Institute of Technology in 1975, and his M. Eng. and Ph.D. in Electric Power Engineering from RPI in 1980 and 2003; respectively. He is a contributing member of the IEEE/PES Transformers Committee and the IEEE Dielectrics and Electrical Insulation Society. He is also a member of Tau Beta Pi, Eta Kappa Nu, and Omicron Delta Kappa. Dr. Balma authored and co-authored several technical publications; and is a registered Professional Engineer and Planner in the State of New Jersey.

Dr. Leonard Bolduc (M'96, SM'01) is one leader of Hydro Quebec R&D activities in the area of "GIC and its effect on Power Transformers". Since his employment at HQ/IREQ in 1975, he has lead and executed many large experimental and theoretical studies on the subject, co-directing two doctorate theses, whose main results were published. On top of his research on transformers and air reactors, he now ensures an active follow-up of the literature, even harmonics recorded continuously by SMDA, GIC-alerts and DC-events affecting the HQ network. He was also responsible for the development of a sub-harmonics ferro-resonance damper for PT, a damper-filter to absorb and reduce harmonics, the Frequency Response of Stray Losses diagnostic method for transformers, a 2 MW Capacitive Divider Substation in operation since 1994, IVACE, overhead-ground-wire power supply regulated by IVACE (50 systems installed) and a blocking device for DC current in transformer neutral (NCBD). Léonard received his B.Sc. in Engineering Physics in 1970 and his Ph. D. in Physics in 1973 from Université Laval in Quebec City. He is a member of Ordre des Ingénieurs du Québec and IEC T38/WG42 (Ferro-resonance in PT).

Dr. Ramsis Girgis is the R&D Manager at the ABB Power Transformer plant, St. Louis, Mo. He is also the leader of ABB's global R&D activities in the area of "Transformer Core Performance". Most recently, he has been the project leader for developing the ABB technology for designing, manufacturing, and noise testing of ultra-low noise power transformers. Ramsis received his Ph.D. degree from the University of Saskatchewan, Canada, in Electrical Power Engineering in 1978. He has over 40 years of R&D experience in the area of power, distribution, and high-frequency transformers, and rotating machines. He has published and presented over 70 technical papers in IEEE, IEE, CIGRE, and other international journals and co-authored chapters in two electrical engineering handbooks on transformer design and transformer noise. He was awarded the IEEE Fellow Grade in 1986. Until recently, he was Chairman of the Performance Characteristics Subcommittee of the IEEE/PES Transformers Committee. He is presently heading the Task Force revising Section 13 of IEEE Standard C57.12.90, regarding transformer noise tests. He is the past Technical Advisor representing the US National Committee in IEC Power Transformer Technical Committee (14).

Dr. Hasse Nordman is the leader of ABB's global R&D activities in the area of "power transformer leakage flux, load loss, and thermal performance". Hasse received his Ph.D. degree from Helsinki University, Finland, in Mathematics in 1976. He has over 40 years of R&D experience in the area of power transformers. He has published and presented a number of technical papers in IEEE, IEE, and CIGRE. Dr. Nordman is a contributing member of the IEEE/PES Transformers Committee and also an active member of the IEC Power Transformer Technical Committee (14).

IEEE/PES Transformers Committee
Spring 2010 Meeting
Houston, Texas USA

"Transformer Tank Rupture and Mitigation"

-- Technical Presentation --
Tuesday, March 9, 2010

By Nick Abi-Samra, Bill Darovny, Marc Foata, Joshua Herz, Craig Swinderman, Peter Zhao

1. Abstract

This technical presentation is resulted from ten presentations made by members of the Task Force on Transformer Tank Rupture and Mitigation, and meeting discussions over past years. Contributions from members and guest are appreciated.

Transformer tank rupture occurs when an internal arcing fault vaporizes the insulating fluid and generates an expanding gas bubble. This causes a pressure rise in the transformer tank. The location, duration and magnitude of the arcing fault will greatly influence the size of the pressure rise in the transformer tank. Transformer tank rupture due to internal arcing fault is a complex problem.

For years, people look for solutions to control or minimize the situations of the tank rupture during internal faults. This presentation provides an overview on current sate of practice and knowledge on the subject, and the mitigations are reviewed.

2. Learning Objectives

The tutorial provides a technical introduction to the current sate of practice and knowledge on the subject, and emphasis will be focused on power transformers. This tutorial presentation includes users' experience, manufacturer's practice, and R&D results on tank ruptures and mitigations.

Also reviewed will be the present coverage from IEEE Transformer Standards on the subject.

3. Learning Outcomes

Attendees will gain the following information from their attendance at this tutorial:

- Understanding of transformer tanks rupture and mitigation
- Phenomenon and nature of the tank rupture
- User experience
- Current state of practice and knowledge

4. Presenters' Biographies

Nicholas Abi-Samra: is responsible for the root-cause analysis efforts at the Electric Power Research Institute (EPRI) for major equipment including transformers. He is also the principal EPRI investigator into major blackouts, in the U.S. and abroad. Prior to EPRI, he was with Westinghouse Electric, where he held positions of increasing responsibilities in engineering and management. He was a Westinghouse Fellow Engineer, providing consultations on a wide spectrum of power system problems. He has taught post-graduate courses at Penn State and Carnegie Mellon Universities and has co-authored over 50 papers. Mr. Abi-Samra is a Registered Professional Engineer and is the recipient of over 15 engineering awards.

William S. Darovny: received a Bachelor of Applied Science degree in Mechanical Engineering from the University of Windsor, Ontario Canada. Bill has over 35 years experience in the power transformer industry. He began his carrier with Westinghouse Canada and was senior Mechanical Engineer involved in the development and design of power transformers and reactors up to 750 MVA and 735 kV. In 1990 he moved to Ferranti- Packard Transformers St. Catharines Ontario Canada where he was Development Manager and Director of Engineering. He was registered as welding engineer for the design and production of power transformers by the Canadian Welding Bureau. Bill joined Siemens Canada in 2006 and provides technical consultation on matters related to transformers. Bill is a member of the IEEE/PES Transformers Committee participating in several working groups within the fluids and power transformers sub committees.

Marc Foata: olds a Mechanical Engineering Degree from the École Polytechnique de Montréal (1983) and a Master's degree in Engineering Mechanics from the University of California in San Diego (1984). After a short stay at Pratt & Whitney in 1984, Mr Foata joined Hydro-Québec in 1985 at the R&D laboratories (IREQ). During his 20 years stay at IREQ, he has been involved in the problems of explosion of high voltage equipment, vibrations of overhead transmission lines and the development of acoustic diagnostic techniques. In 2005, he joined TransÉnergie where he is now a substation engineer with the department of technical expertise and support. Mr. Foata holds a Mechanical Engineering Degree from the École Polytechnique de Montréal (1983) and a Master's degree in Engineering Mechanics from the University of California in San-Diego (1984).

Joshua Herz: received a B.S. Mechanical Engineering degree from Massachusetts Institute of Technology in 1980 and is currently a Principal Engineer at Qualitrol LLC in Fairport, NY. He has worked as a design engineer in process controls and components at United Electric Controls, Cambion and C & K Components, and holds several patents related to pressure relief.

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