WESTERN TURBINE Users

Pasadena
March 2012

22ND ANNUAL CONFERENCE AND EXHIBITION

Pueblo Airport Generation Station's LMS100s, LM6000s first GTs to enter service in 2012

W.T.U.I.

San Diego Convention Center

Save the dates: March 10-13, 2013

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WESTERN TURBINE Users

22nd Annual Conference and Exhibition

Published by
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WELCOME ALL to the 2012 meeting of the Western Turbine Users Inc! Our mission continues, to advance the reliability and operability of the General Electric line of aeroderivative gas turbines.

The WTUI charter is aimed at overcoming the challenges faced by operators in improving the day-to-day reliability and operability of these machines. The dedication and innovative efforts of our members; the support of GE technical services in response to User experiences; and the collaboration of the Users with the OEM and the Engine Repair Depots have combined to make GE aeros some of the most reliable gas turbines going.

This is WTUI's 22nd annual meeting to discuss the issues facing our industry. The members of your all-volunteer Board of Directors, breakout-session chairs, conference coordinators, GE-authorized Repair Depots, and our industry vendors and exhibitors have again prepared a great program. As always, our aim is to produce this technical conference in a pleasant venue at a low cost. We hope you enjoy the attractions Pasadena has to offer. A special thanks to all involved for their sincere efforts at achieving these goals. Enjoy the conference activities and we hope you find your time spent with us valuable.

This is your conference. Your feedback and suggestions are welcome. Please let us know how we can better serve you by contacting one of the breakout-session chairs, any member of the Board of Directors (look for the color-coded shirts), emailing us at info@wtui.com, or by simply completing and submitting the conference questionnaire provided with your registration materials.

Again, welcome to Pasadena. Thanks for coming. Enjoy yourselves!

Please accept our sincerest regards and best wishes for success,
Jon Kimble, Wellhead Services Inc
President, WTUI

Where to go (see floor plan, p 10)

Registration: Foyer outside Exhibit Hall

Exhibition: Exhibit Hall

Breakfasts: Ballroom D-E and foyer outside Ballroom D-E

Luncheons: Ballroom D-E

LM2500 breakout meetings: Ballroom B
Chair: John Baker, Riverside Public Utilities

LM5000 breakout meetings: Ballroom A
Chair: Andrew Gundershaug, Calpine Corp

LM6000 breakout meetings: Ballroom F
Chair: Brian Atkisson, Riverside Public Utilities

LMS100 breakout meetings: Ballroom H
Chair: Don Haines, Wood Group Power Plant Solutions

Sunday, March 18

AFTERNOON

2:00 to 7:30	Registration
4:00 to 5:30	New user orientation/LM engine familiarization, *Ballroom A* Bob Boozer, PPL University Park LLC **Users only**

EVENING

5:30 to 8:30	Welcome reception, *Exhibit Hall* **All conference attendees**

Monday, March 19

MORNING

7:00 to 8:00	Breakfast
7:00 to 4:00	Registration
8:00 to 4:30	Exhibit Hall open
8:00 to 8:45	General Session, *Ballroom D-E* **All conference attendees**
8:45 to 10:00	Depot presentations, *Ballroom D-E* **All conference attendees**
10:00 to 10:15	GE Services presentation, *Ballroom D-E* **All conference attendees**
10:15 to 10:45	Break in Exhibit Hall **All conference attendees**
10:45 to noon	Breakout meetings: LM2500, LM5000, LM6000, LMS100 **Users, Depots, and GE only** Note: Jackets will be raffled off at the beginning of selected sessions

AFTERNOON

Noon to 1:00	Luncheon (golf and tennis awards) **All conference attendees**
2:30 to 5:00	Breakout meetings: LM2500, LM5000, LM6000, LMS100 **Users, Depots, and GE only** User plant presentations follow depot presentations Note: Jackets will be raffled off at the beginning of selected sessions

EVENING

6:30 to 8:30	Monday night dinner (Conference Center, see p 6 for details) **Must have badge for entry**

PROGRAM

Tuesday, March 20

MORNING

7:00 to 8:00 Breakfast

7:30 to 4:00 Registration

8:00 to 4:30 Exhibit Hall open

8:00 to 8:30 Worldwide gas-turbine business update, *Ballroom D-E*
Mark Axford, Axford Turbine Consultants LLC
All conference attendees

8:30 to 10:00 Breakout meetings: LM2500, LM5000, LM6000, LMS100. **Users only**
Note: Jackets will be raffled off at the beginning of selected sessions

10:00 to 10:30 Break in Exhibit Hall

10:30 to noon Breakout meetings: LM2500, LM5000, LM6000, LMS100. **Users, Depots, and GE only**
Note: Jackets will be raffled off at the beginning of selected sessions

AFTERNOON

Noon to 1:00 Luncheon (recognition of board and session chairs)
All conference attendees

3:30 to 4:30 Special technical presentations
All conference attendees

1. "GT Inlet Filtration (HEPA Systems)," *Ballroom A*
   Rob McMahon, Alliance Pipeline
   Steve Medvetz, W L Gore & Associates
2. "User Panel: GT Package Improvements," *Ballroom B*
   Brad Hans, Lincoln Electric System
   Ed Jackson, Missouri River Energy Services
3. "GHG Impacts of California AB32 and Federal Regulations," *Ballroom F*
   Michael Taylor and Jackie Ferlita, Element Markets Inc

4:30 to 5:30 Special technical presentations
All conference attendees

1. "NERC Program Compliance Audits," *Ballroom A*
   Chris Siplin, Wood Group Power Services
2. "Peaker versus Baseload O&M," *Ballroom B*
   Dale Reed, ANZ/Reed Services
3. "Tools for Optimizing GT SCR Performance" *Ballroom F*
   L J Muzio and T D Martz, Fossil Energy Research Corp

Wednesday, March 21

MORNING

7:00 to 8:00 Breakfast

7:30 to noon Registration

8:00 to 10:30 Breakout meetings: LM2500, LM5000, LM6000, LMS100
Users, Depots, and GE only
Note: Jackets will be raffled off at the beginning of selected sessions

10:30 to 10:45 Break in Ballroom Foyer

10:45 to 11:45 GE new products update, *Ballroom D-E*
All conference attendees

11:45 to noon Wrap-up and adjourn, *Ballroom D-E*
All conference attendees
Note: Two special jackets will be raffled off at the beginning of the wrap-up session

SOCIAL FUNCTIONS

Social events are critical to the success of every user group because they enable people to meet in a relaxed environment and expand their networks for problem-solving. The Western Turbine Users is hosting several functions in 2012 that you won't want to miss; some would not have been possible without financial support from sponsors identified on signage in the Exhibit Hall. Please thank them when you have the opportunity.

The headline events are described below. Note that buses will be provided for the golf and tennis tournaments on Sunday and for the spouse tour on Monday; also, there are special fees for the golf and tennis tournaments and the spouse tour.

Arroyo Seco Racquet Club

Sunday events

The golf tournament, the first official function of the 2012 WTUI Conference, will be conducted Sunday, March 18, at the Angeles National Golf Club, which is about 15 miles from the hotel. Tournament Co-Chairs and Board Members Jim Bloomquist and Wayne Kawamoto advise that buses will pick up golfers outside the main entrance of the Sheraton at 5:45 a.m., Hilton at 6, and Westin at 6:15. They expect more than 100 participants.

Format will be a four-person, 18-hole shotgun scramble. Prizes will be awarded at the Monday luncheon for lowest team score, men's and women's longest drive, and closest to the pin.

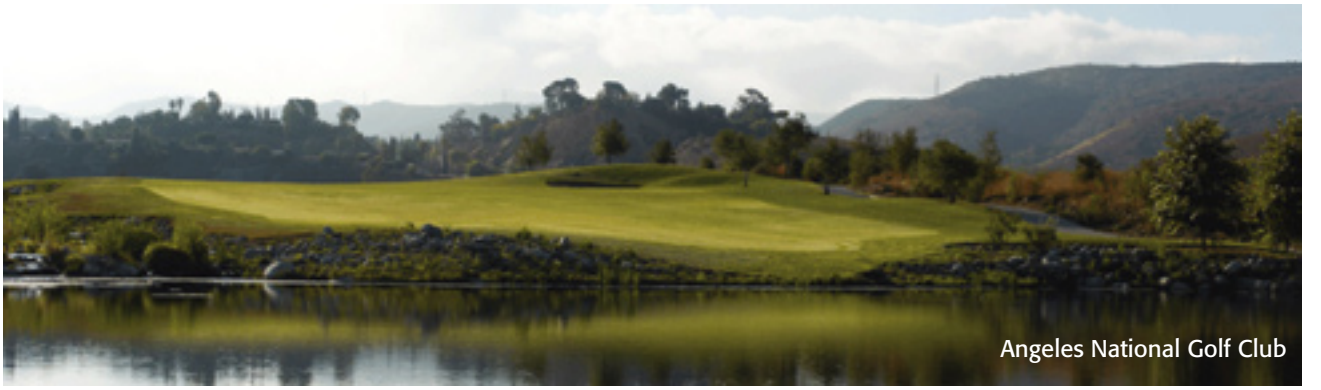
The Angeles National is a par 72 championship 18-hole golf course with a desert style layout. Designed by the Nicklaus Design group, the course is nestled at the base of the Angeles National Forest. It offers magnificent views, generous fairways, and immaculate emerald greens. The course accommodates golfers of all skill levels—from beginners to professionals—with four sets of tees: Black is 7141 yards, blue 6597, white 6169, and red 4899.

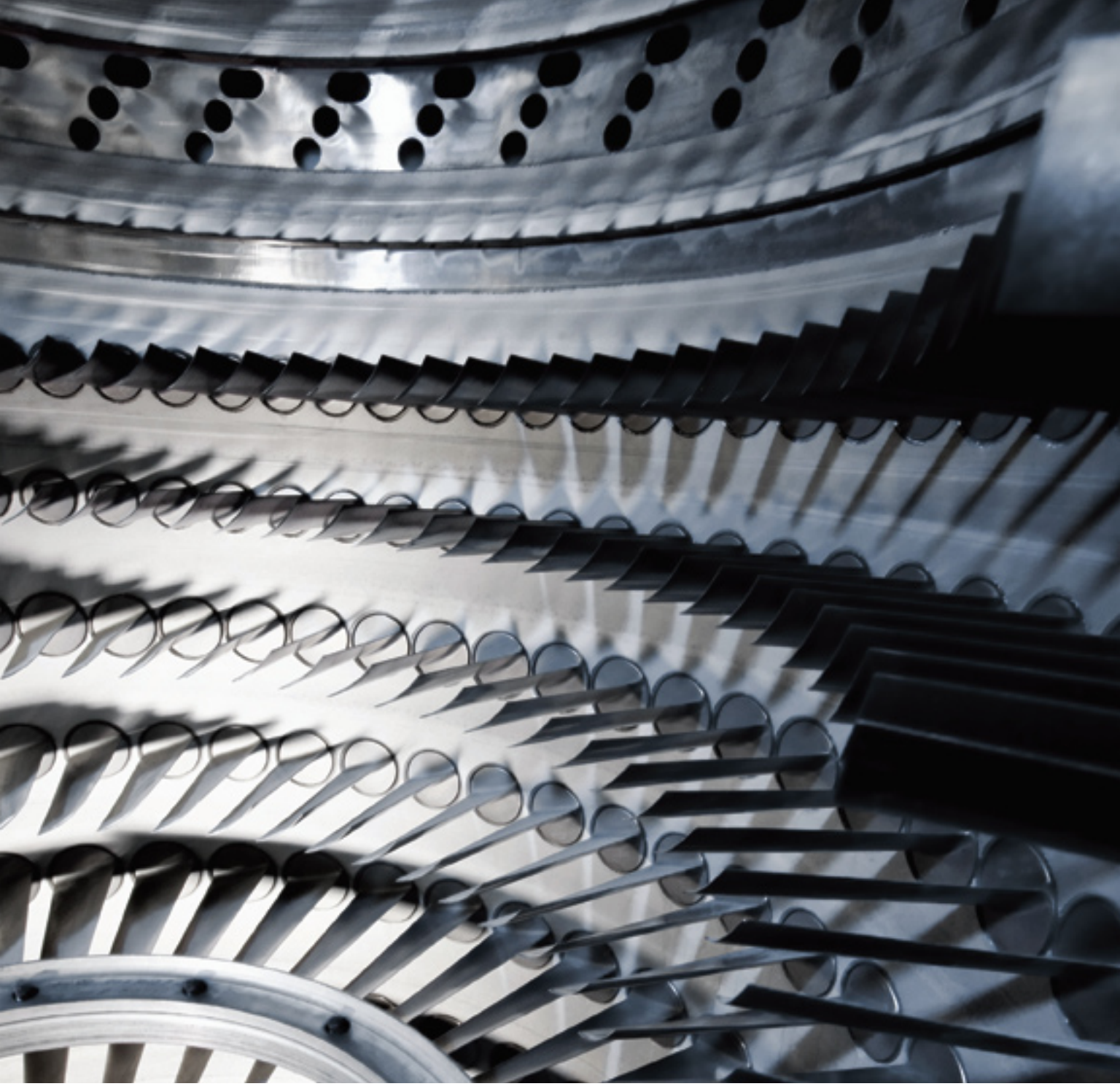
The course was ranked by *Travel + Leisure Golf* magazine as one of the Top 30 Best New Courses Worldwide and one of the Top 10 Best New Public/Resort courses in the US. Fairways are seeded with Tifway Bermuda grass, greens are of Bentgrass. Two lakes, one creek, and 54 bunkers offer challenges.

The tennis tournament, chaired by WTUI Past President Jim Hinrichs, will be at the Arroyo Seco Racquet Club

in South Pasadena, only a few miles from the hotel. Players are requested to meet the bus outside the Sheraton lobby at 9:30 a.m. About a dozen participants are expected. The club features nine outdoor courts.

The group's Sunday evening welcome reception, which includes the opening of the exhibition, runs from 5:30 to 8:30 in the Exhibit Hall (see map, p 10). Upwards of 1000 user and vendor participants are expected. WTUI Treasurer Wayne Kawamoto of Corona Energy Partners Ltd says, "Don't miss it!"


Angeles National Golf Club



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City Hall

Monday events

Spouse tour. Spouses board their buses in front of the Convention Center at 9 a.m. and tour the city's famous and infamous movie sites. Pasadena's long history with the movie industry began 100 years ago with the filming of D W Griffith's *The Queen's Necklace* on the grounds of the Fenyes Mansion.

After touring with Pasadena Heritage, your destination will be the Vertical Wine Bistro, owned by film producer and local resident Gale Anne Hurd. The bistro offers more than 400 wines on its eclectic list. The contemporary dining room with a custom floor-to-ceiling glass wine cellar will be your own private and relaxing wine pairing luncheon with a sommelier.

Enjoy the rest of your afternoon exploring Old Pasadena and its quaint boutique shops along Holly Street and Union Street, as well as the chains along Colorado Boulevard.

The Monday night reception will be on the lower level of the Conference Center, beginning at 6:30. The Conference Center is a short walk from the Sheraton, Hilton, and Westin hotels. IMPORTANT: You MUST have your conference badge with you to attend this event. NO EXCEPTIONS.


Exhibit Hall


Conference Center

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Offering level 1 to 4 repair and overhaul services on GE aero-derivative LM2500 and LM5000 gas turbines, out of its fully licensed Auckland, New Zealand depot for almost three decades. Some of our specialised Depot Services consist of

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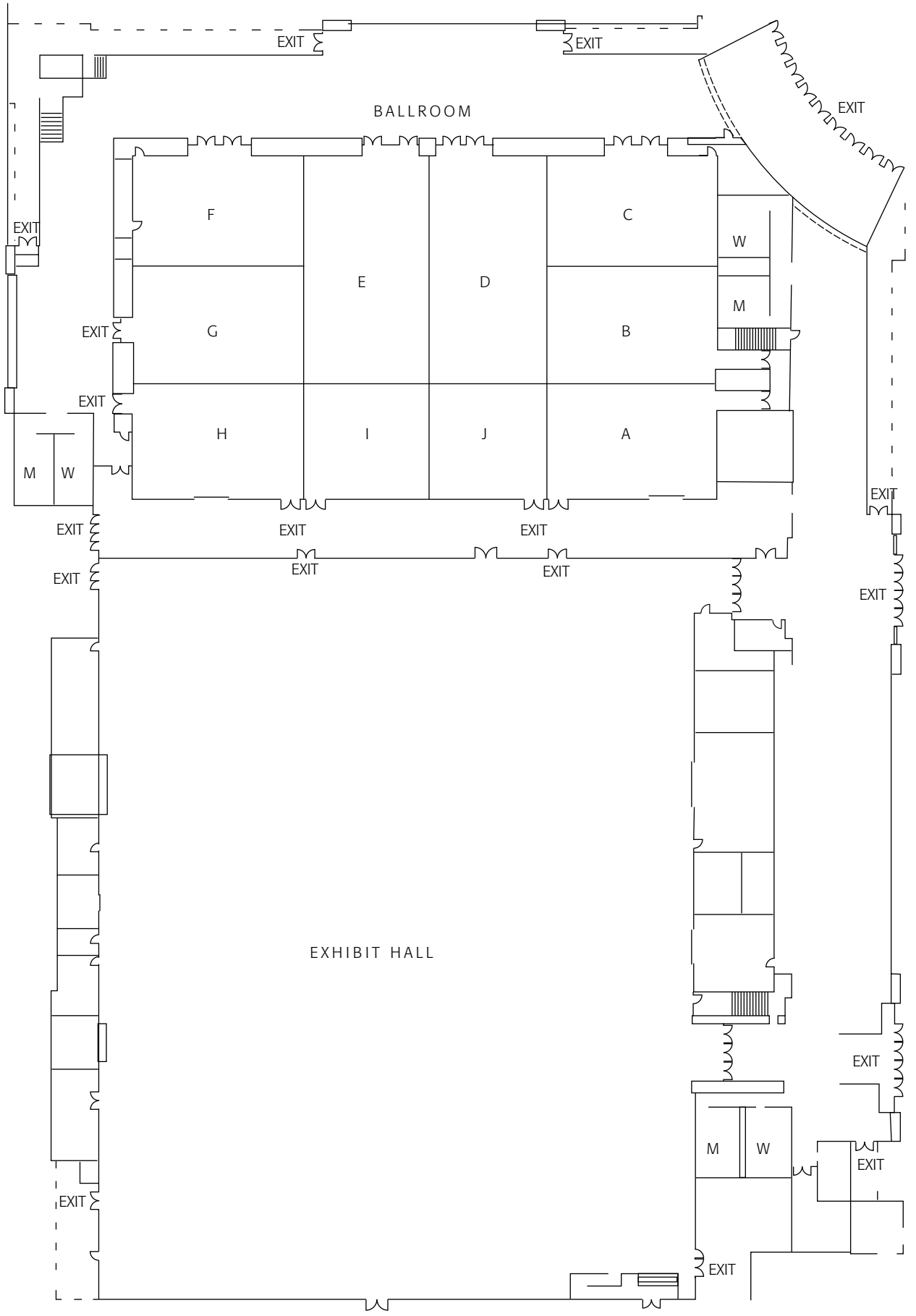
PASADENA CONVENTION CENTER



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TransCanada Turbines (TCT) is an OEM-licensed global service provider for aeroderivative industrial gas turbines manufactured by GE and Rolls-Royce. TCT provides complete support for the Rolls-Royce Avon, RB211, RB211 DLE, and GE LM2500, LM2500+ and LM6000 gas turbines under one roof.

In July 2011, TCT opened a new, custom-built overhaul and repair facility in Airdrie, Alberta. Conveniently located 20 minutes north of Calgary, Alberta, the new facility houses production, project management and support staff for both TCT's General Electric Level 4 services and Rolls-Royce MROC services. This purpose-built facility is 220,000 square feet and is complete with state-of-the-art equipment and tooling. TCT is proud to offer all of its customers immediate induction for all engine types.

In the spring of 2012, TCT will complete construction on a state-of-the-art LM6000 test cell, located in Calgary.

TCT Field Service Office Locations: Houston, Texas; Syracuse, New York; Bakersfield, California; and Cumbernauld, Scotland.

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T4A 0K8

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Sheraton Pasadena Hotel

303 E Cordova St
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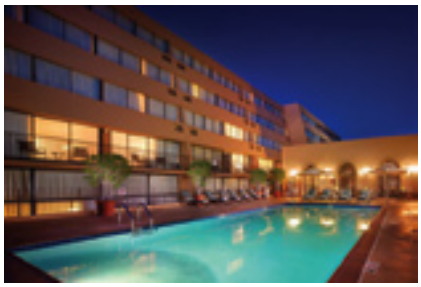

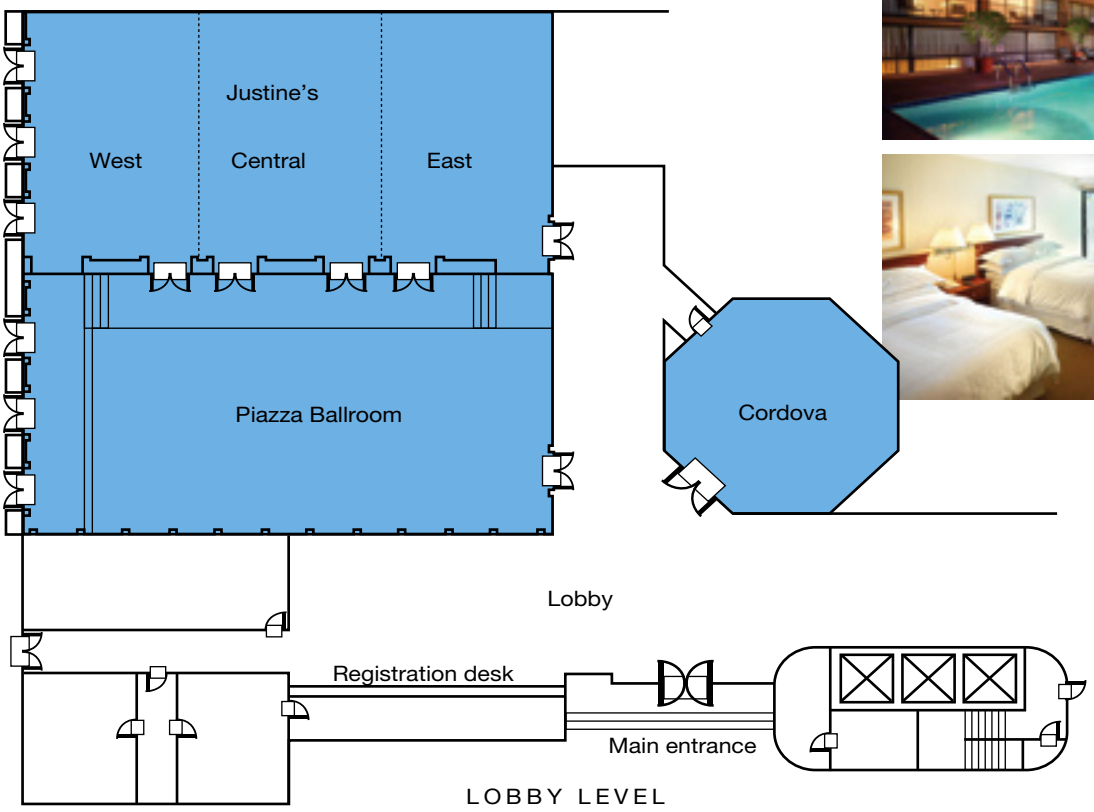

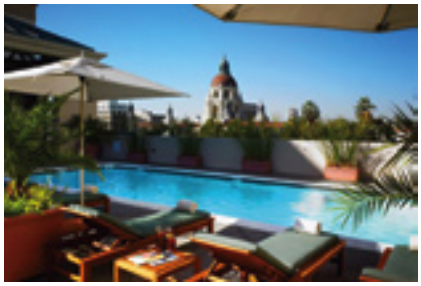


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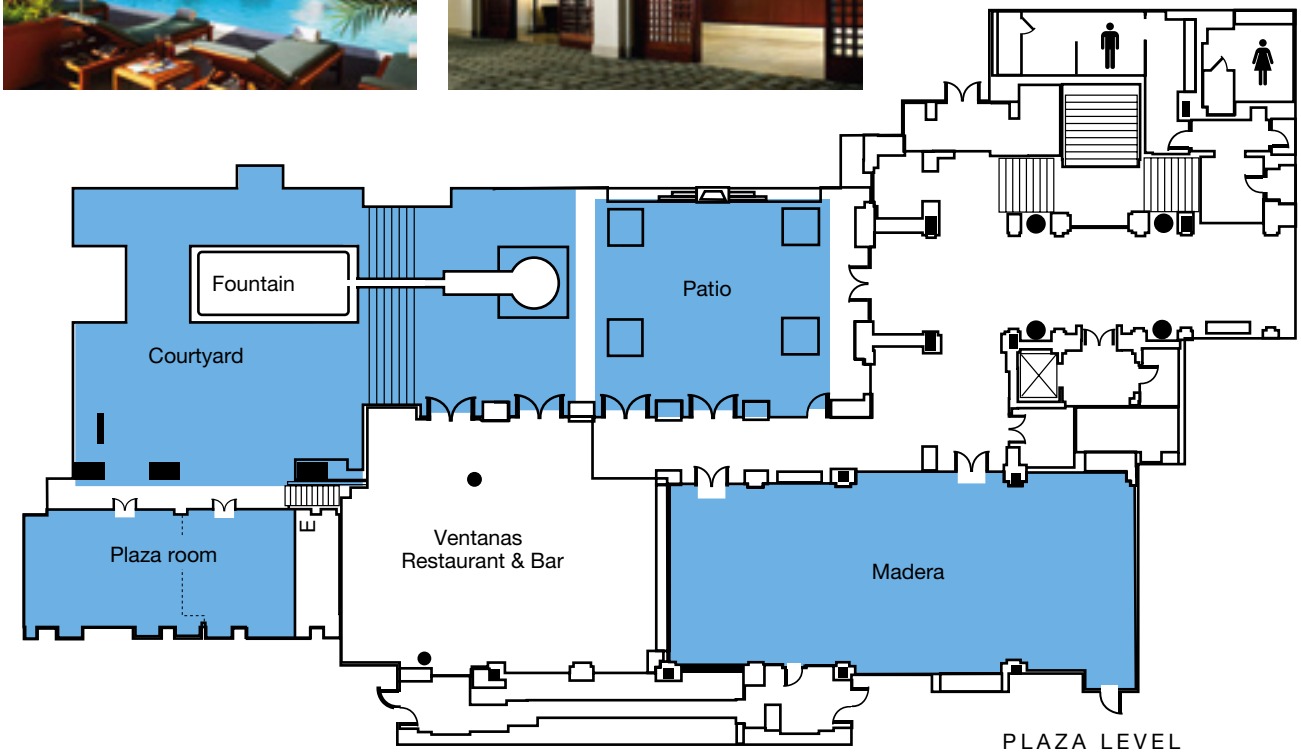

Badge Rules

Qualifications

Blue

User members who are registered conference attendees.

Yellow

Depots: GE, TCT, MTU, Avio, IHI, ANZ.

Red

Exhibitors

Orange

Registered spouses (paid).

Pre-registered spouses of registered conference attendees who have pre-purchased spouse meal plans.

Black

Special one-day pass.

These attendees include students, press, convention/hotel special guests, and city officials.

Requests submitted by special interest groups/individuals that have been approved in advance by the board of directors.

Gray

Board of directors, officers, and staff (including SPS note-takers).

Elected members of the board of directors, appointed officers, and conference staff.

Hilton Pasadena

168 S Los Robles Ave
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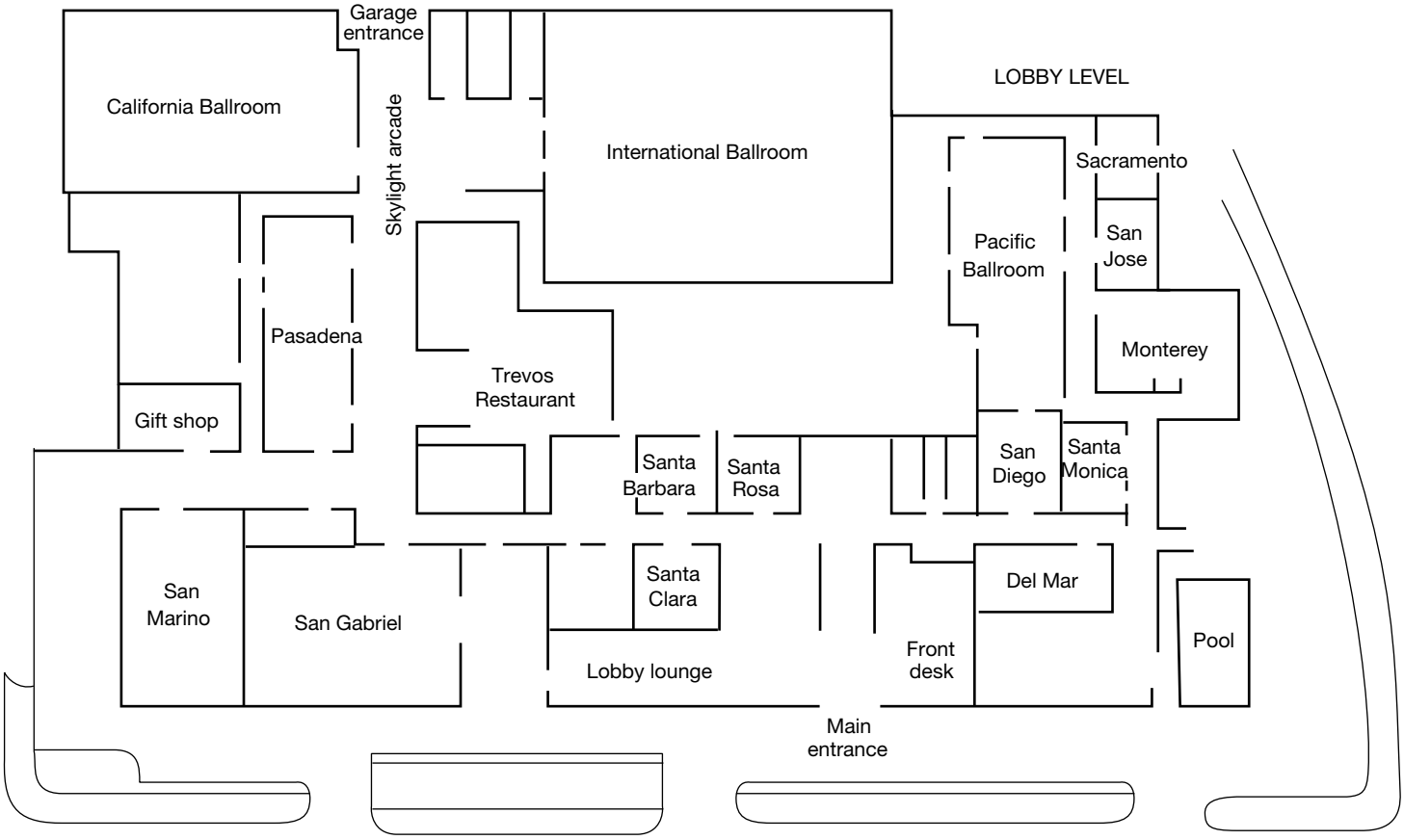

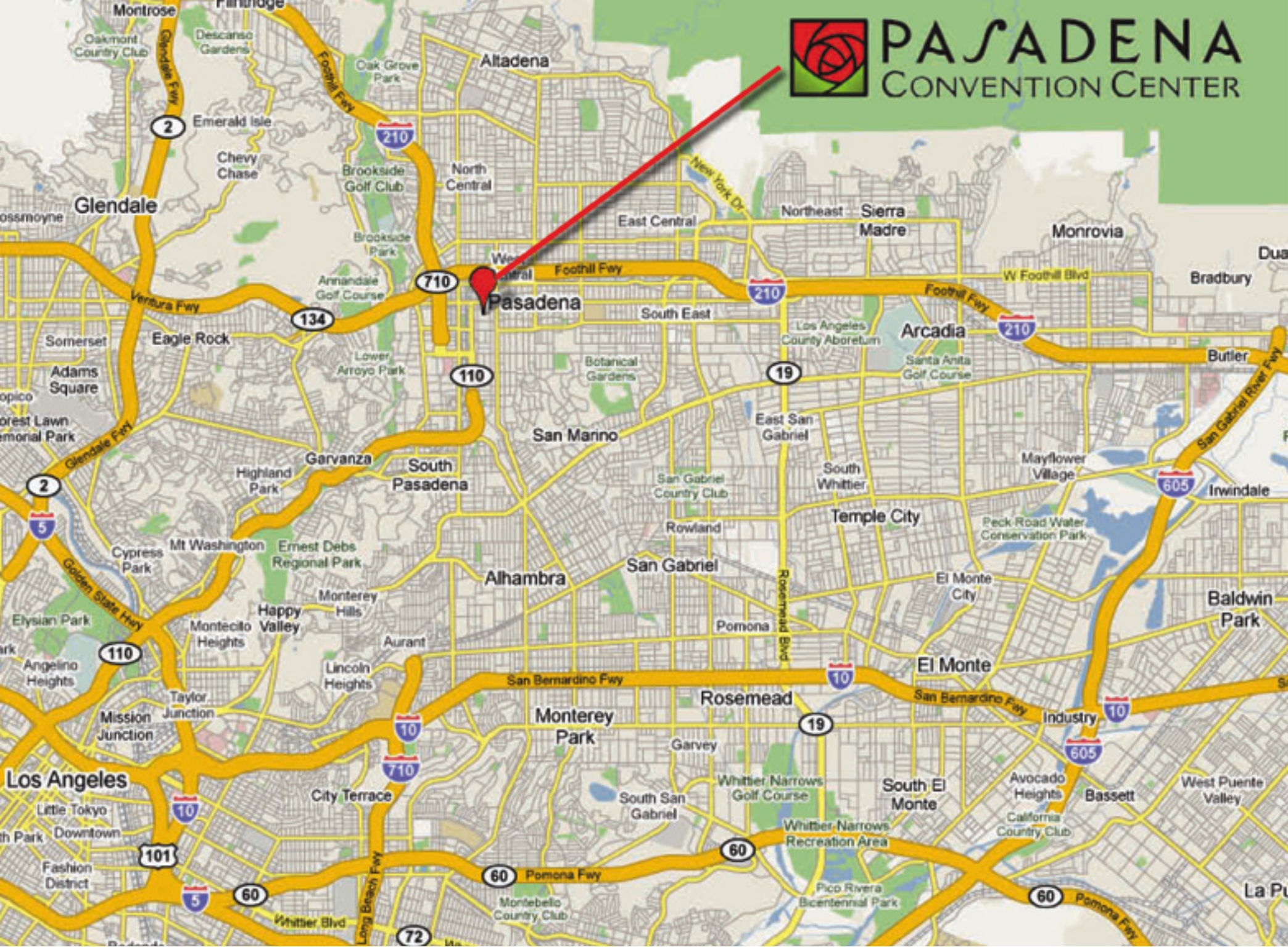
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North Central
East Central
Northeast
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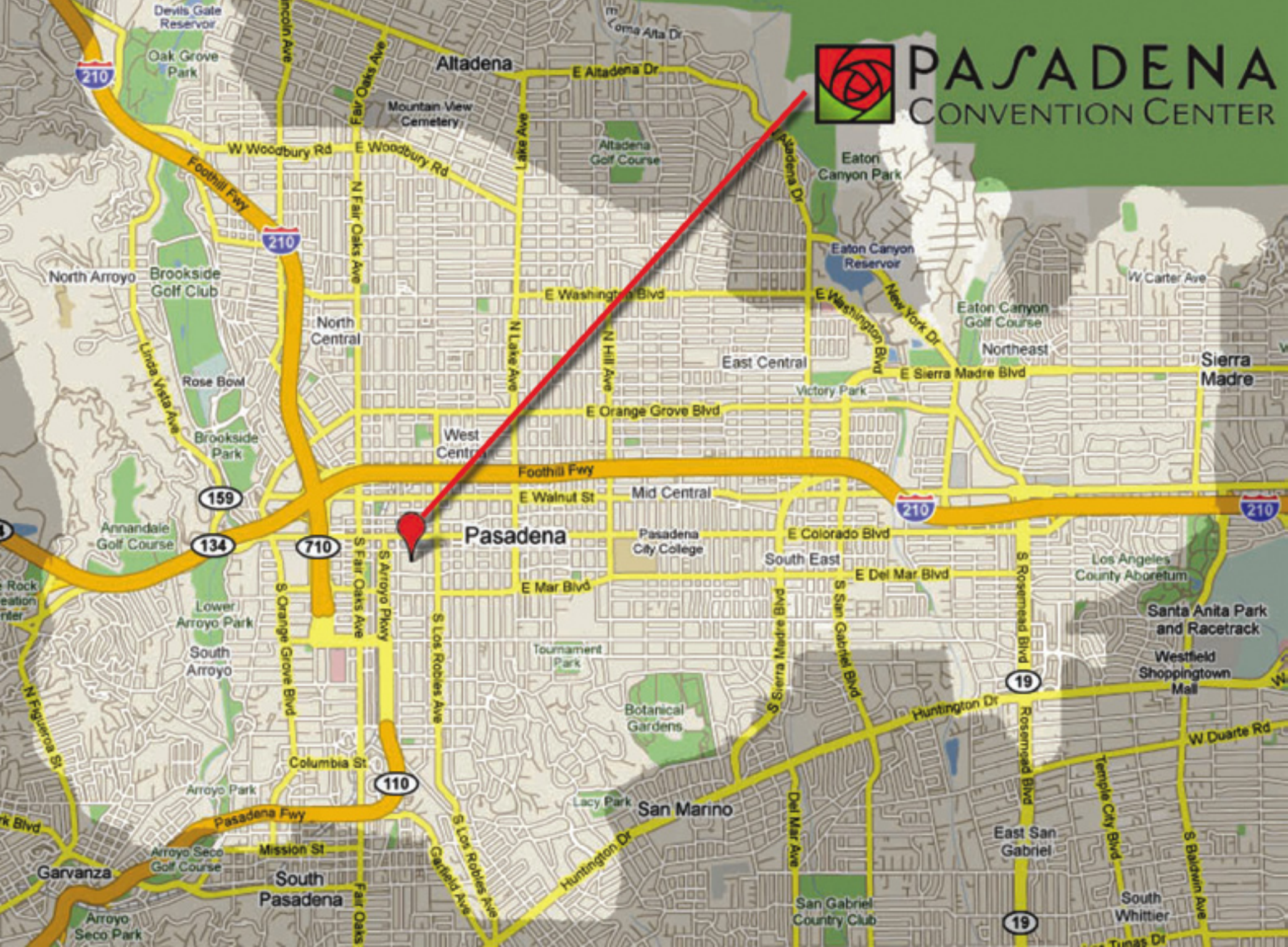
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ACRONYMS TO REMEMBER

AGB—Accessory gearbox (also called the transfer gearbox)

AVR—Automatic voltage regulator

CCM—Condition maintenance manual

CCR—Customized customer repair

CFF—Compressor front frame

COD—Commercial operating date

CPLM—Critical-parts life management

CRF—Compressor rear frame

CWC—Customer web center (GE)

DEL—Deleted part

DLE—Dry, low emissions combustor

DOD—Domestic object damage

EM—Engine manual

FFA—Front frame assembly

FOD—Foreign object damage

FPI—Fluorescent penetrant inspection

FSNL—Full speed, no load

GG—Gas generator (consists of the compressor and hot sections only)

GT—Gas turbine (consists of the gas generator pieces with the power turbine attached)

HCF—High-cycle fatigue

HGP—Hot gas path

HPC—High-pressure compressor

HPCR—High-pressure compressor rotor

HPCS—High-pressure compressor stator

HPT—High-pressure turbine

HPTN—High-pressure turbine nozzle

HPTR—High-pressure turbine rotor

IGB—Inlet gearbox

IGV—Inlet guide vane

IPT—Intermediate-pressure turbine (LMS100)

IRM—Industrial repair manual

LM—Land and marine

LCF—Low-cycle fatigue

LO—Lube oil

LPC—Low-pressure compressor (not on LM2500; just LM5000 and LM6000)

LPCR—Low-pressure compressor rotor

LPT—Low-pressure turbine

LPTR—Low-pressure turbine rotor

LPTS—Low-pressure turbine stator

NGV—Nozzle guide vane

OEM—Original equipment manufacturer

PN—Part number

PT—Power turbine (turns a generator, pump, compressor, propeller, etc)

PtAl—Platinum aluminide

RCA—Root cause analysis

RFQ—Request for quote

RPL—Replaced part

SAC—Single annular combustor

SB—Service bulletin

SL—Service letter

SUP—Superseded part

STIG—Steam-injected gas turbine

TA—Technical advisor

TAT—Turnaround time

TAN—Total acid number (lube oil)

TBC—Thermal barrier coating

TGB—Transfer gearbox (also called the accessory gearbox)

TMF—Turbine mid frame and thermal mechanical fatigue

VBV—Variable bleed valve (not on LM2500; just LM5000 and LM6000)

VIGV—Variable inlet guide vanes

VSV—Variable stator vane

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Meet WTUI's officers, directors

Officers

Jon Kimble
President
This is Jon Kimble's 22nd year working in all phases of gas-turbine powerplant development, construction, commissioning, O&M, administration, shutdown, and decommissioning. He's been a WTUI member most of that time, serving on the Board of Directors from 2004 to 2007 and as President since 2008. Jon is employed by Wellhead Electric Co.

Bill Lewis
Vice President
Bill is Plant Manager for PPL Generation LLC's Lower Mount Bethel Energy LLC. Previously he was responsible for the company's simple-cycle peaking gas turbines located in Connecticut, Pennsylvania, and Illinois. Lewis served six years in the US Navy as a Gas Turbine Specialist, rising to the rank of Petty Officer First Class before taking a shore-side job.

Jim Bloomquist
Vice President
Jim has served as a Board Member and is now one of the organization's VPs. He has 35 years of service with Chevron specializing in major power systems, process facilities, and gas-turbine generation. His current position is the Electrical Engineering Supervisor for Chevron's San Joaquin Valley Business Unit (an upstream oil producing company).

Chuck Casey
Secretary
Chuck is Generation Manager for the Riverside (Calif) Public Utilities. Riverside is the third largest municipality in the state and supplies power to over 105,000 residents and businesses. Before joining Riverside in 2006, he worked as an operator, I&E technician, and plant manager for Stewart & Stevenson, General Electric Co, and PurEnergy. Chuck began his career as a nuclear electrician on US Navy fast attack submarines. He currently serves WTUI as Secretary, Co-Exhibit Hall Manager, and Assistant Webmaster; previously Chuck was LM6000 Breakout Session Chair and a member of the Board of Directors.

Wayne Kawamoto

Treasurer

Wayne is one of the founders of the Western Turbine Users and has served on the Board and as Treasurer since incorporation. He has a BS degree in Civil Engineering from the Univ of Hawaii and has held numerous positions in project management throughout his 37 years of professional employment. Wayne is the Plant Manager of Corona Energy Partners Ltd.

Board of Directors

David Merritt

Board Member

David recently joined Kings River Conservation District, where he manages the organization's LM engine and hydro assets. Previously, he spent 19 years in the O&M groups of GWF Power Systems/GWF Energy LLC. There David had responsibility for the maintenance of LM peakers and a solid-fuel-fired powerplant. Prior to GWF, he served in the US Navy as an aviation electrician.

John Baker

Board Member

John is a Plant Manager for Riverside Public Utilities. Previously he was O&M Manager for Calpine Corp's Bethpage Energy Center in Hicksville, NY, where he was responsible for two LM2500s and two LM6000s. He started his gas turbine career with Calpine at Watsonville, later working at the company's Agnews and Los Esteros facilities before moving to the East Coast. Prior to Calpine, John was in boiler operations at Foster Wheeler Energy Corp.

Brad Hans

Board Member

Brad is the Plant Supervisor at Terry Bundy Generating Station for Lincoln Electric System, a Nebraska municipal utility. Bundy is a 3 × 1 LM6000-powered combined-cycle facility. Brad came to LES from the John Deer Engine Works. The professional engineer began his career with the Navy Civil Engineer Corps.

Donald Stahl

Board Member

Donald is Plant Manager for the Pueblo Generation Facilities in Colorado. He manages two powerplants totaling 380 MW of utility and non-regulated generation owned by Black Hills Energy—Colorado Electric and Black Hills Colorado IPP, respectively. Stahl came to the company in 2010 to manage installation and commissioning of the two LMS100s and four LM6000s at Pueblo.

Alvin Boyd

Board Member

Alvin is the Power Production Superintendent for Pasadena Water & Power, a municipal utility that has provided power to its customers for more than 100 years. He has 24 years of service with the City of Pasadena, specializing in plant operations and management. Before joining Pasadena, Alvin spent nine years in the US Navy, mustering out as Machinist Mate First Class. He has served on the WTUI Board of Directors since 2008.

Ed Jackson

Board Member

Ed is Plant Manager of Missouri River Energy Services' Exira Generating Station in Brayton, Iowa. His gas-turbine experience includes Allison 501s, Solar Centaurs, LM2500s, and LM6000s. Previously he was a combined-cycle plant supervisor at Maui Electric Co and a field service and commissioning engineer for Stewart & Stevenson. Jackson spent eight years in the US Navy as a GT systems technician (electrical).

Don Haines

Board Member

As Plant Manager for Wood Group Power Plant Solutions at the Panoche Energy Center, Don is in charge of four LMS100s. Before joining Wood Group, he worked at the City of Santa Clara for more than 18 years, serving the city's generation assets in technical and management capacities. Before moving to Santa Clara, Don served for six years on the USS Ingersoll.

Supporting Members

Wayne Feragen

Webmaster

Wayne is Senior West Coast Plant Manager for Noresco, currently responsible for powerplants in Colton, Calif, and San Diego. Wayne has over 21 years of powerplant experience, starting as a Gas Turbine Electronics Technician First Class in the US Navy. After leaving the service, he went to Newark Pacific Paperboard and ran an LM2500. After that, he worked at two Sunlaw plants running LM2500s. Wayne has served as WTUI's Webmaster for the last five years.

Charlene Raaker

Conference Coordinator

As WTUI's Conference Coordinator (and Mike Raaker's better half), Charlene has been supporting the organization for almost as long as it has been in existence. Charlene's is the "voice on the other end of the line" whenever anyone calls the group.

Mike Raaker

Technical Consultant

What do diapers, toilet paper, jet engines, and WTUI have in common? Mike Raaker. He started his career at Procter & Gamble, assigned to install a cogeneration plant at the company's towel and tissue plant in Oxnard, Calif. The LM2500-powered facility would keep Mike busy for the next 30 years and would lead to his, and wife Charlene's, participation in WTUI.

Joella Hopkins

Conference Coordinator

Jennifer Minzey

Conference Coordinator

Jennifer Kim

Conference Coordinator

Joella is founder and president of Simply Mumtaz Events Inc, based in Burbank, Calif,

where Minzey is Event Manager and Kim the Event Consultant. Simply Mumtaz is highly regarded for its meeting and exhibition planning and event management services, and has awards to prove it. Company activities also include contract negotiation, program development, and post-conference. Hopkins, Minzey, and Kim have produced the Western Turbine meeting for the last several years.

Breakout session chairs

LM2500

John Baker

Board Member

John is a Plant Manager for Riverside Public Utilities. Previously he was O&M Manager for Calpine Corp's Bethpage Energy Center in Hicksville, NY, where he was responsible for two LM2500s and two LM6000s. He started his gas turbine career with Calpine at Watsonville, later working at the company's Agnews and Los Esteros facilities before moving to the East Coast. Prior to Calpine, John was in boiler operations at Foster Wheeler Energy Corp.

LM5000

Andrew Gundershaug

Andrew is the operations manager for several of Calpine Corp's generation assets in the Yuba City area of Northern California: Greenleaf 1, Greenleaf 2, Yuba City Energy Center, and Feather River Energy Center. He has been with Calpine since entering the power industry in 1998 as an IC&E technician at the Watsonville Cogeneration Plant after graduating from UC Santa Cruz. Over the last 14 years, Andrew has specialized in control-system operation and maintenance for LM2500, LM5000, and LM6000 engines.

LM6000

Bryan Atkisson

Bryan is the O&M Supervisor for four LM6000 peakers owned by the City of Riverside, Calif. The Marine Corps veteran has more than a decade of experience operating and maintaining LM6000s and was involved in the construction and commissioning of the four Riverside units. He has been a WTUI LM6000 session chair since 2007.

LMS100

Don Haines

Board Member

As Plant Manager for Wood Group Power Plant Solutions at the Panoche Energy Center, Don is in charge of four LMS100s. Before joining Wood Group, he worked at the City of Santa Clara for more than 18 years, serving the city's generation assets in technical and management capacities. Before moving to Santa Clara, Don served for six years on the USS Ingersoll.

Updating gas-turbine reliability, availability

By Salvatore A DellaVilla Jr, CEO, Strategic Power Systems Inc

There was very little positive change in 2011 over recent years. Tornados, floods, and Fukushima aside, the lack of political collegiality—if not downright incivility—displayed by the US Congress, and during the near collapse of several European economies, has exacerbated the lack of confidence in global markets—including energy. Investment is a commitment to the future, a promise of a fair rate of return based on an acceptable level of market certainty. As 2011 drew to a close, that promise seemed elusive.

Yet, as I am an optimist, 2012 can hold promise for a new beginning. The Western Turbine Users Inc (WTUI) represents a long-standing commitment to the future and to the energy industry. The breakout sessions and other technical presentations at this year's meeting will provide insight to current issues with recommended solutions. As always, the rate of return for those who actively participate is high—and certainly not elusive.

Data in this report are SPS ORAP Verified

Strategic Power Systems Inc (SPS) has participated in the annual Western Turbine conference and user meeting since its inception and appreciates the strong support from the leadership and many owner/operators who participate in the Operational Reliability Analysis Program (ORAP®). SPS personnel perform three main functions in support of the WTUI conference:

- Take detailed notes during the technical sessions. These are posted at www.wtui.com after the meeting.
- Introduce ORAP during the new-user orientation session on Sunday afternoon.

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ORAP RAM metrics: Historical perspective

	2011	2006-2010	2001-2005
Aeroderivative			
Service factor, %	40.4	42.6	44.2
Service hours per start	33.9	32.0	37.1
Capacity factor, %	30.8	33.5	36.0
Availability, %	91.0	92.5	94.1
Forced outage factor, %	4.1	3.3	2.3
"E" class			
Service factor, %	39.2	37.0	36.3
Service hours per start	54.3	47.9	42.4
Capacity factor, %	36.9	35.0	34.1
Availability, %	94.2	94.5	94.7
Forced outage factor, %	1.1	1.3	1.1
"F" class			
Service factor, %	55.4	53.9	55.2
Service hours per start	67.4	53.7	47.5
Capacity factor, %	49.0	47.2	50.1
Availability, %	91.4	93.0	92.6
Forced outage factor, %	2.6	1.7	2.0

- Present RAM (reliability, availability, and maintainability) benchmarks and market comparisons during the break-out sessions.

SPS' preparation for the Western Turbine conference normally begins with the opportunity to take a careful look at ORAP performance metrics for aerodertivative (aero), "E' class, and "F" class technologies across all OEMs and a wide range of owner/operators. For nearly 25 years, ORAP data have provided the opportunity to assess and understand trends in equipment duty and performance.

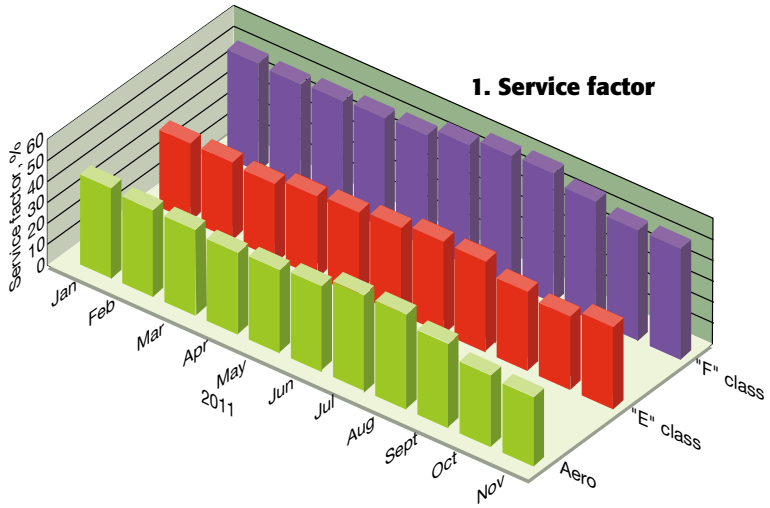
The table shows the most current ORAP data for 2011 (January through November), 2006-2010, and 2001 to 2005. The intent of using these three time periods is to highlight performance trends over significant periods of time—including the most current.

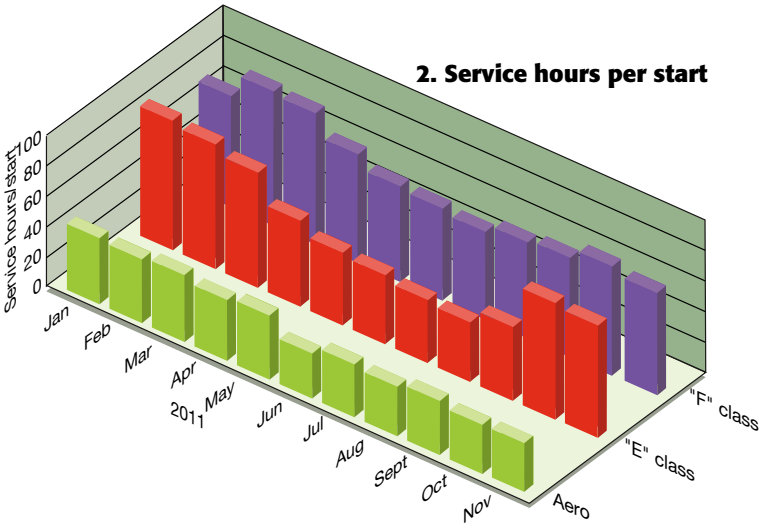
The RAM metrics discussed below include service factor (the percentage of time a unit is generating power) and the ratio of service hours (the amount of time power was supplied to the grid) to starts. These numbers are indicative of the duty cycle or period of demand filled by the generating equipment.

Don't confuse service factor with capacity factor, which also appears in the table. The latter is the ratio of the power an engine produced in a given time period to that which it was capable of generating. Finally, availability and forced-outage factor show the impact of lost time and generation attributed to outages—both planned and forced.

Aero metrics

- The aeroderivative metrics show a decreasing service factor, period over period, since 2001-2005. In 2011, aeros operated 3539 annual service hours, a decrease of 192.8 hours when compared with 2006-2010, and a decrease of 332.9 hours when compared with 2001-2005.
- The service hours/start ratio decreased as well—from 37.1 hours/start for 2001-2005 to 33.9 in 2011. Annual starts were relatively constant for 2011 when compared with 2001-2005 (104 annual starts). However, 2011 starts were substantially lower when compared with 2006-2010 (average of 117 annual starts).





- Capacity factor shows a continual decrease, period over period, since 2001-2005. This indicates a reduced level of power output.
- Availability continually decreased, period over period. Annual outage hours increased from 516.8 hours in 2001-2005 to 657 in 2006-2010 to 788.4 in 2011. Annual forced-outage hours and maintenance outage hours increased, period over period.
- Forced-outage hours represented 45.6% of all outage time in 2011 compared with 44% in 2006-2010 and 39% in 2001-2005.

"E" class metrics

- The "E" class metrics show an increasing service factor, period over period, since 2005. In 2011, "E" class units operated 3434 hours, an increase of 192.7 hours when compared with 2006-2010 and an increase of 254 hours when compared with 2001-2005.
- The service hours/start ratio increased from 42.4 hours/start in 2001-2005 to 54.3 in 2011. Annual starts decreased, period over period, from 75 in 2001-2005 to 68 in 2006-2010 to 63 in 2011.
- Capacity factor increased, period over period, since 2001-2005. This indicates an increased level of power output.
- Availability decreased slightly, period over period. Unavailability went from 5.3% in 2001-2005 to 5.5% in 2006-2010 to 5.8%

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Plant Reliability: EtaPRO APR™ detects problems others don't

The Harrison Power Station, operated by a subsidiary of FirstEnergy Corp., evaluated EtaPRO APR™ and its unique localized modeling approach on ten critical pieces of equipment being monitored by their legacy system. In late March 2011, EtaPRO APR™ initiated an alarm, while no alarm was initiated by the legacy system. After investigation, Harrison staff found a control system fault in a hydrogen cooler bypass valve. Had this problem continued undetected, Harrison would have been forced to shut down for repairs.

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in 2011. Unavailability was driven by an increase in maintenance outage hours, period over period.

- Forced-outage hours represented 19% of all outage time in 2011 compared with 23.6% in 2006-2010 and 20.8% in 2001-2005.

"F" class metrics

- The "F" class metrics show the highest level of service factor when compared with both aero and "E" class units, period over period. In 2011, "F" class units operated 4853 hours in 2011, compared with 4721.6 in 2006-2010 and 4835.5 in 2001-2005.
- The service hours/start ratio increased, period over period, from 47.5 hours/start in 2001-2005 to 53.7 in 2006-2010 to 67.4 in 2011. Annual starts decreased from a high of a 102 in 2001-2005 to 72 in 2011. The nominal 30% decrease in annual starts in the last 11 years reduces the adverse impacts of cyclic duty for these "F" class units.
- Capacity factor was higher than it was for the aero and "E" class units.
- Availability was relatively consistent, period over period, with 2011 showing the lowest level of any reporting period. In 2011, "F" class units were unavailable 8.6% of the time, or 753.4 outage hours. This was an increase of 140 outage hours when compared with 2006-2010 and an increase of 105 hours when compared with 2001-2005.
- Forced-outage hours represented 30.2% of all outage time in 2011, compared with 24.3% in 2006-2010 and 27% in 2001-2005.

End notes

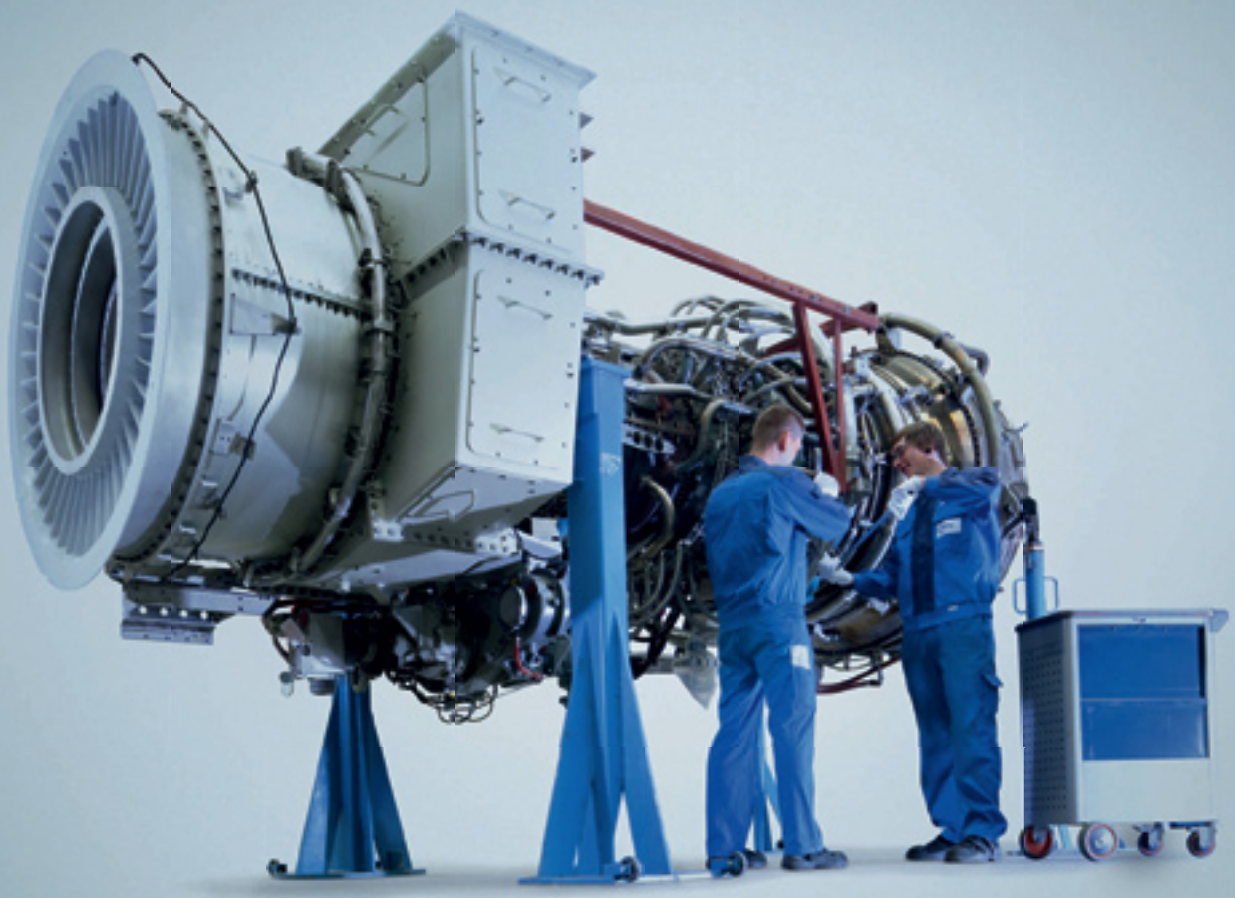
The illustrations show 2011 ORAP data on a monthly basis (January through November 2011). Note from Fig 1 that there is little variability in the service factor for the three technology classes. This indicates that service hours and starts are relatively uniform on a monthly basis. No significant summer or winter peak is evident from the metrics.

Interestingly, however, both "E" and "F" class units have slightly higher service hours per start ratios in both the beginning (January, February, March) and end of 2011 (October and November). Perhaps this reflects the need for longer run cycles without increasing monthly service hours. The service hours per start ratio for aeros is relatively consistent on a month-to-month basis.

It is clear that many variables drive RAM performance. WTUI provides an opportunity to address the current issues, concerns, and operating constraints that can be managed to maximize RAM performance. Please stop by Booth 308 and speak with us at your convenience.

Finally, if you are looking for more economic stability and market certainty in 2012, don't hold your breath. After all, it is a Presidential election year.

MTU Maintenance



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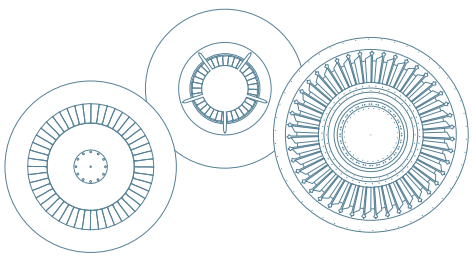

SPS, ORAP® celebrate 25 years of service to the industry in 2012

Since 1987, SPS has processed and added to its ORAP database plant operational, failure, and maintenance data representing more than 22,000 unit years and over 280,000 forced, scheduled, and unscheduled outages. Today, data from over 2000 gas and steam turbines are reported on a monthly basis for review and validation prior to being entered into ORAP. It is these data that allow SPS to provide RAM benchmarks for use in the energy market for both heavy duty and aeroderivative plants across the various OEMs, technologies, applications, and duty cycles.

Data come to SPS from a variety of plant sources, including onsite operators and maintenance personnel, as well as from central operations staff. In some cases, SPS obtains operating data directly from the unit control or onsite historian; however, outage detail must always come from site or central staff.

Regardless of the source, it is an SPS operating rule that no plant information can be added to the ORAP database without passing both a Manual Data Validation (MDV) and an Automated Data Validation (ADV) process, following industry standards like IEEE Standard 762 and ISO 3977.

All data received are reviewed by an SPS Customer Service Engineer; focus is on reasonableness and technical accuracy. Any questions that arise in the data must be addressed directly with the participating plant's point contact as soon as possible and before the data can be entered into the ORAP database for reporting purposes. SPS takes full responsibility for the accuracy and the quality of reported data and spends the engineering time to drive to the highest level of quality possible.

There is a significant emphasis placed on all reported outages—forced, scheduled, and unscheduled—down to one-tenth of an hour. When assessing forced outages, the objective is to clearly understand the symptom, corrective action, and eventually the root cause of failure. In terms of scheduled or unscheduled maintenance, the emphasis includes the time to perform and the frequency of maintenance, compared with recommended OEM practice.

SPS spends a significant amount of effort for all outages to ensure that the assignment of a standard equipment code, at a system and component level, is accurate and reflects the performance of the specific technology. The company uses the Electric Power Research Institute (EPRI) Standard Equipment Codes (EBS), which is a detailed taxonomy of current product offerings.

While there are many ADV rules to automatically review and assess the data for accuracy, it is only with the completion of the MDV process that plant data can be submitted for addition to ORAP. Customer reports cannot be issued without the responsible and accountable Customer Service Engineer passing reviewed and approved plant information to the reporting database. The objective is to manage and contain data discrepancies, and to ensure reporting accuracy.

The SPS data review and validation process is rigorous and time-consuming. Yet, it is a critical to quality requirement. It is essential that the engineering review of field data be performed by knowledgeable engineers, who understand the plant equipment and have a strong attention to detail. It is what makes ORAP a unique and value-added information resource in the energy market.

Finally, for those of you who participate on ORAP and will soon start to submit data to NERC, we can facilitate this activity. Stop by Booth 308 to find out how.

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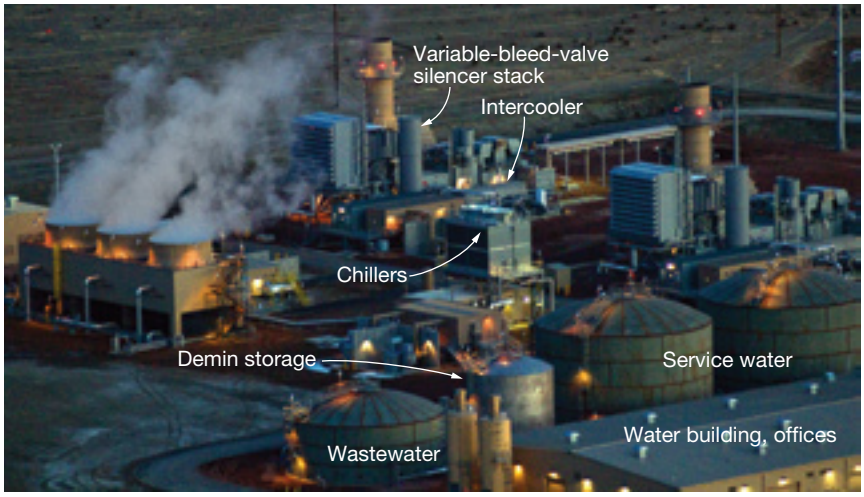
LMS100 peakers, LM6000 combined cycles power Black Hills' world-class Pueblo Airport Generation Station

You'll know Don Stahl when you see him on the show floor or in one of the breakout sessions. He'll be wearing a gray-striped badge and a big smile. The gray stripe means he's an active participant on Western Turbine's management team (see Badge Rules, p 14).

Two reasons for the big smile:

- Stahl was appointed to serve on the Board of Directors for the Western Turbine Users Inc in September 2011.
- The 380-MW combination simple-cycle/combined-cycle facility that Stahl manages for South Dakota-based Black Hills Corp, located just over the fence from the Pueblo (Colo) airport, began commercial operation Jan 1, 2012 and it has been running virtually problem-free.



1. Two LMS100s share one three-cell cooling tower to vent the heat of compression removed by the intercoolers. Wastewater tank collects drains, cooling tower blowdown, etc, which is then forwarded to an RO system in the water building. High-solids stream goes to the evap pond, low-solids stream to mixed-bed demin units. Demin water cools the combustion process to reduce NO_x emisions

2. Two LM6000PF-powered 2 × 1 combined cycles at high noon

The plant is unique. It features two LMS100 peakers owned by Black Hills Energy, a regulated electric utility serving 94,000 customers in southeastern Colorado (Fig 1) and two LM6000PF-powered 2 × 1 combined cycles owned by Black Hills Colorado IPP, an independent power producer (Fig 2). Both of these owners are, in turn, subsidiaries of Black Hills Corp. All generating units are located on the same site and operated by a common staff from a common control room.

Here's how this came to be. In July 2008, Black Hills Corp acquired five Aquila Inc utilities in four states, including its electric and gas utility operations in Colorado, where the company does business as Black Hills Energy. At the time of the acquisition, Xcel Energy had already notified Aquila that its agreement to supply about 75% of the Colorado utility's electricity needs would not be renewed when the contract expired at the end of 2011.

In August 2008, Black Hills Energy filed its Electric Resource Plan with the Colorado Public Utilities Commission (CPUC) and offered an analysis of the best and least-cost option for serving customer needs when the Xcel agreement expired at the end of 2011.

Director of Operations George Tatar, also in Pasadena for the Western Turbine meeting (but wearing a blue badge), recalled that the resource plan "looked at every available option." System peak was slightly less than 400 MW at the time but was expected to be 406 MW in 2012 with an additional 61 MW needed for reserve capacity. The installation of fuel-efficient generation assets was a priority. Only natural gas-fired facilities could be permitted and

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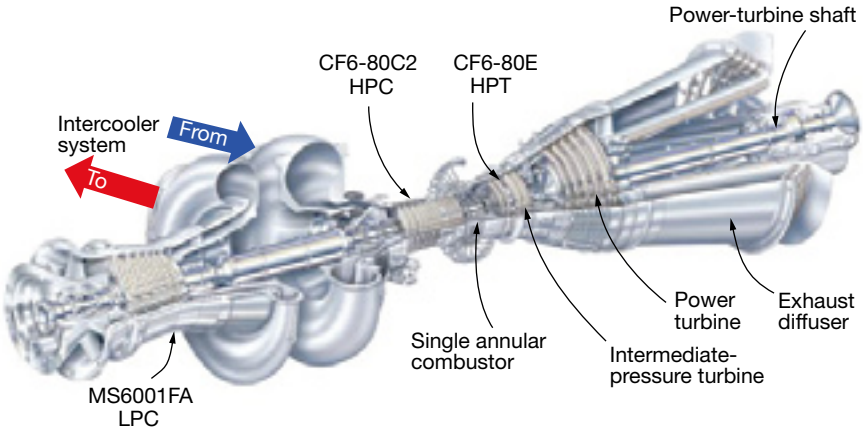

3, 4. LMS100 combines proven components from the OEM's aero and frame product lines. Photo is of the engine's supercore

installed on time and the need to have the capability to back up intermittent renewable energy resources required quick start natural-gas-fired facilities.

The two engines installed on the Pueblo site were the only two gas turbines in GE's ecomagination™ product portfolio when they were ordered. To earn ecomagination approval, a product is evaluated for its ability to significantly and measurably improve the owner's environmental and operating performance. The LMS100 offers a simple-cycle efficiency of 46% and is said to offer the highest level of performance of any aero on the market. The LM6000PF offers fast-start capability and low emissions (15 ppm NO_x).

In March 2009, the CPUC approved the construction of the two LMS100s by Black Hills Energy but decided that the company should conduct a competitive solicitation for the remaining capacity needed. An independent evaluator was hired to oversee the competitive solicitation. Black Hills Corp formed Black Hills Colorado IPP to participate in that bidding process. The unregulated subsidiary was selected as the winning bidder and received a 20-yr PPA (power purchase agreement) to provide the remaining energy needed to serve customers when the Xcel contract expired Dec 31, 2011.

LMS 100 simple-cycle units

The LMS100 peakers are equipped with chillers (Stellar Energy Americas) in their respective Altair® air-inlet filter houses. The exhaust system,

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IHI INC. NY Office 150 East 52nd Street, 24th Floor, New York, NY 10022 Tel:212-599-8100 Email: eiji_okuyama@IHIINC.IHI.CO.JP
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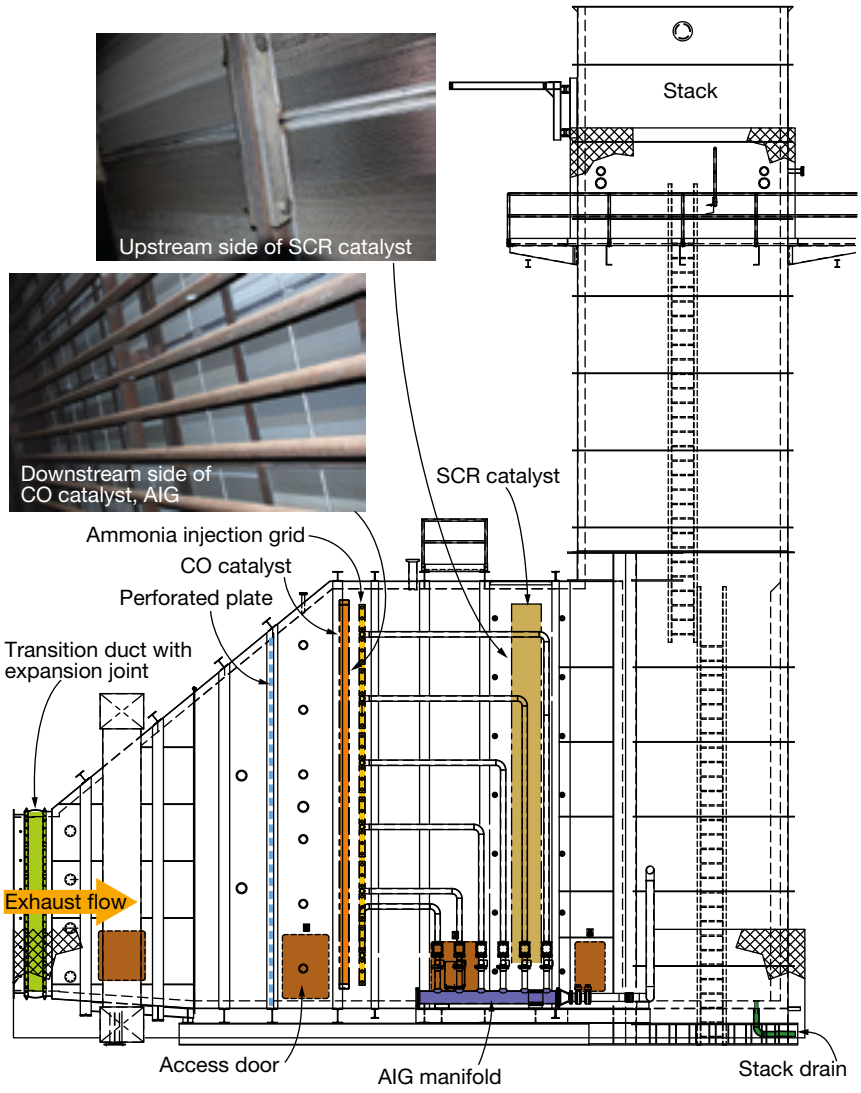
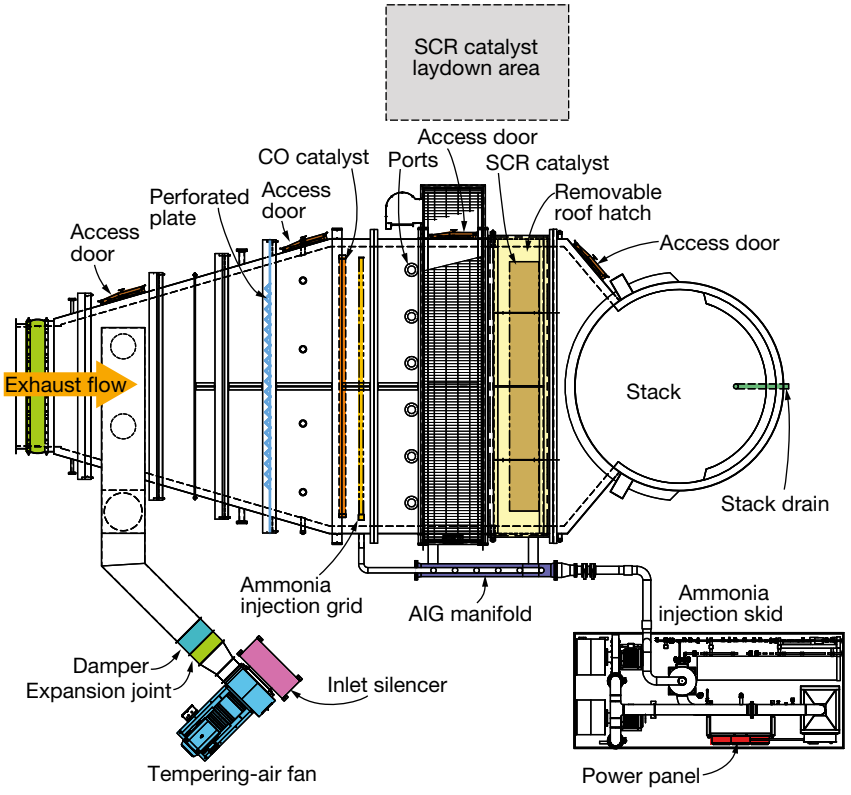
which includes catalyst and support equipment for NO_x and CO emissions reduction, was supplied by Braden Manufacturing LLC.

Engine details. Simply put, the LMS100 is a three-shaft gas turbine

5, 6. Exhaust section for Pueblo LMS100 features redundant equipment (PLC connections to the plant DCS, tempering-air fans, ammonia vaporizers) to maintain NO_x and CO emissions within permit limits





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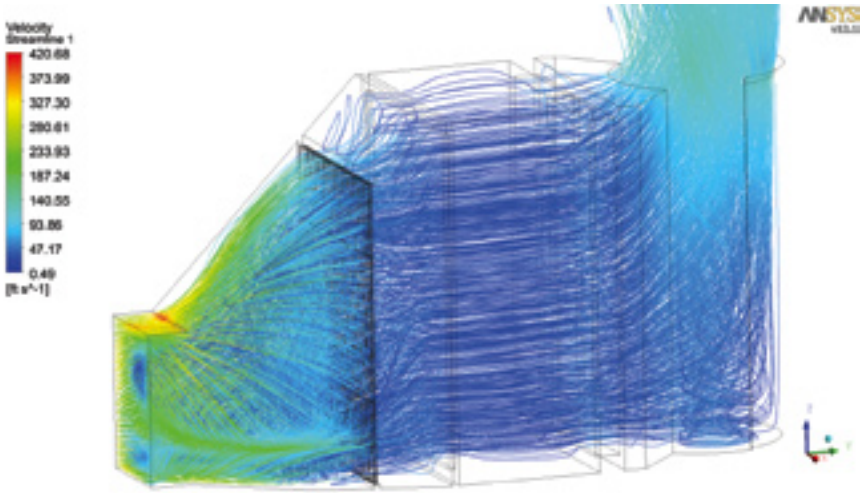
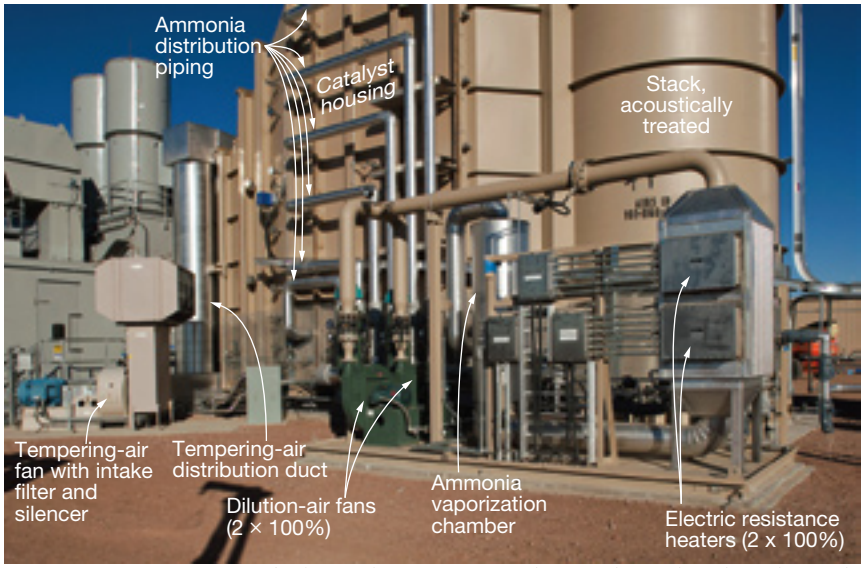


7. CFD tools were used to assure proper flow of exhaust gas from the gas-turbine outlet to the stack



8. Ammonia injection skids for the SCR were fabricated, insulated, and wired before being shipped to the jobsite

9. Very large subassemblies were prefabricated and shipped to Pueblo

that uses intercooling technology to increase power and efficiency. It incorporates elements of on-wing and industrial gas turbines and is said to represent the most extensive collaboration of design and manufacturing expertise in the history of GE.

Referring to Figs 3 and 4, note that the six-stage LP compressor was derived from the MS6001FA; the so-called "supercore," which includes the 14-stage HP compressor, combus-

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tor, and HP turbine, is derived from the CF6-80C2 and CF6-80E aircraft engines that power many Boeing 747s and 767s. Pressure ratio is 42:1. The HP turbine consists of two air-cooled stages; the IP turbine has two stages and the power turbine five. The generator is air-cooled.

Service intervals at this stage of engine experience are the following:

- Every 4000 hours, conduct borescope inspection. Planned outage duration is 12 hours including the cool-down time.
- Every 25,000 hours, hot-gas-path (HGP) inspection. Spare module—combustor and HP and IP turbines—is installed and the unit restarted within four days; owner's engine is sent to the shop for overhaul.
- Every 50,000 hours, major inspection. Same as HGP, plus power-turbine overhaul, LP compressor and shaft inspection/maintenance, and inspection of the following major components: booster, intercooler, scroll frames, HP compressor, aft shaft, and hydrodynamic bearings. Roller and ball bearings are replaced. There is a 60-day turn on all this work which can be reduced to four days if rotating spares are installed while shop work is done.

Fleet operating history. At the time of last year's Western Turbine conference, 21 LMS100s were operating at a dozen plants in six countries, and as many as eight machines (including the two at Pueblo) were scheduled for commissioning or installation. Fleet operating hours through 2010 approached 63,000, starts exceeded 11,000. The high-time engine was just a few hours shy of 15,000.

Fleet RAM (reliability, availability, maintainability) stats are presented below. They were compiled by Strategic Power Systems, Charlotte, based on the 16 LMS100s reporting data through the company's ORAP® system for the period January 2008 through December 2010.

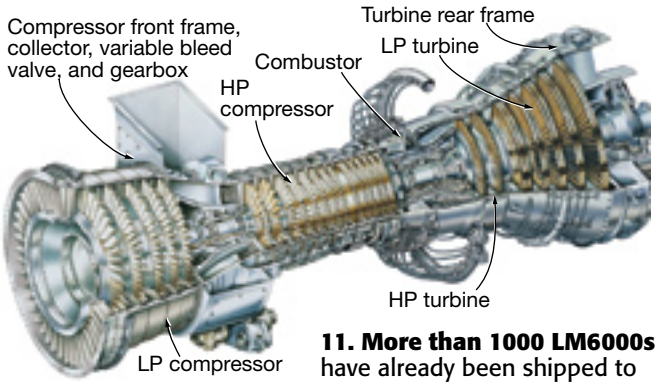
- Availability, engine only (including the intercooler), 94.7%.
- Availability, simple-cycle plant (including engine, generator, and station equipment), 87.7%.
- Reliability, engine only, 97.8%.
- Availability, simple-cycle plant, 94.6%.

Starting reliability as reported by the OEM was 97.8% based on a 12-month rolling average through December 2010. The OEM's expected goals for a mature product—defined as 100,000 total service hours—is 99.2% reliability, 97.1% availability.

Exhaust section. Braden had total responsibility for the exhaust sections of both LMS100s. The project included supply of the NO_x and CO reduction systems (catalysts by Haldor Topsoe Inc and BASF's Catalysts Div, respectively), ammonia injection skids for the SCRs (provided by Braden subsidiary Consolidated Fabricators LLC), tempering air systems, exhaust stacks, and PLC connections to the plant DCS (Figs 5, 6).

The air permit for the LMS100s establishes limits sufficient to allow operation of all units 100% of the time. The limits for the two LMS100s are as follows:

10. Stacks were trucked to the site in two pieces



11. More than 1000 LM6000s have already been shipped to customers

- NO_x, 5 ppmvd at 15% O_2.
- CO, 10 ppmvd at 15% O_2.
- VOC, 2.5 ppmvd at 15% O_2.
- Acoustic, 60 dB(A) at the fence line.

In designing the exhaust section, Braden was able to meet a tight schedule requirement by employing in-house engineering for all major disciplines—mechanical, electrical, structural. In addition, gas flow modeling (Fig 7) was performed by Braden engineers along with acoustic modeling for stringent noise abatement. Pressure drop was a key concern to meet efficiency goals. Braden brought its years of experience in the design of ductwork and exhaust and silencing systems to bear to hold backpressure under 10 in. H_2O.

The ammonia injection skids were fabricated, insulated, and wired in Consolidated's shop to assure fast installation at the jobsite (Fig 8). And, to minimize fit-up errors onsite, Braden fabricated very large subassemblies offsite and trucked them to Pueblo (Fig 9). An additional benefit of pre-fab was a reduction in site labor requirements. High reliability of the exhaust sections is assured by use of redundant PLCs, fans, and ammonia heaters.

The insulated stacks (71 ft tall × 13.5 ft diam) have a floating liner system to accommodate the thermal cycles. The stacks were trucked to the site in two pieces for rapid erection on a foundation provided by Black Hills (Fig 10). Teamwork among personnel from Braden, Black Hills, the construction contractor, and the turbine manufacturer minimized the amount of time required for commissioning and verification of emissions permit requirements.

One cooling tower serves both LMS100s to release heat absorbed by water flowing through the engine intercoolers.

LM6000PF combined cycles

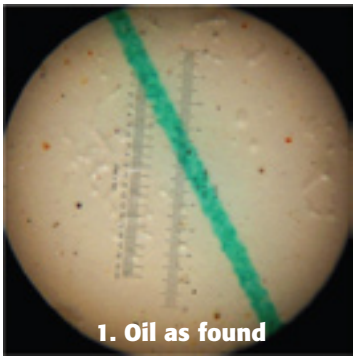
The two chiller-equipped LM6000PF gas turbines in both combined cycles are connected through dual-pressure Nooter/Eriksen Inc heat-recovery steam generators to a steamer made by Siemens Energy Inc in the Czech Republic. The 40-MW gas turbines have air-cooled generators, the 20-MW steamer water-cooled. Boiler blowdown is routed to the cooling tower provided for each combined cycle.

Interestingly, one of the four LM6000s installed at Pueblo was the 1000th of that model series shipped by GE. Last year at this time, the LM6000 fleet had accumulated 21.8-million operating hours for 260 customers in 43 countries on six continents. The engine is installed in 37 states at home. The high-time unit in the fleet at the beginning of 2011 had accumulated more than 114,000 hours of operation.

The cutaway of a typical LM6000 in Fig 11 reveals a five-stage LP compressor and 14-stage HP compressor. Pressure ratio is 28.5:1. On the turbine end, the HP unit has two stages, the LP turbine has six. Fig 12 shows an LM6000PF.

12. LM6000PFs installed at Pueblo are each rated a nominal 40 MW

How to quickly remove water, particulates from turbine oil

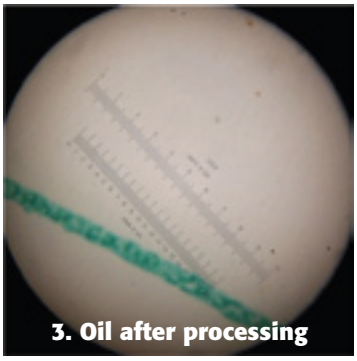


Prefiltration/dehydration ISO Cleanliness Code was 18-16-14. This translates to 2500 to 1300 particles per milliliter larger than 4 mm; 640-320 larger than 6 mm; 160-80 larger than 14 mm

Plant managers are challenged to deal with the unexpected during virtually every outage. For Roger Bishop, the person responsible for a LM6000-powered 3 × 1 combined cycle and other assets at South Texas Electric Cooperative Inc's (STEC) Sam Rayburn Power Plant (Nursery, Tex), it was lube-oil contamination caused by a violent rainstorm in the middle of a January 2012 outage.

The Dresser-Rand steam turbine serving the nominal 180-MW combined cycle was down for maintenance and the rotor was out of the unit when rain hit, forcing water into the machine's lube-oil reservoir. This happened despite having tarpaulins covering the unit. Approximately 3000 gal of expensive turbine oil was contaminated to more than 6000 ppm of water—enough to turn the fluid milky. At this level of contamination, the oil oxidation rate and machine bearing wear increases by a factor of

2. Vacuum dehydrator oil purification system extracts water and particulates from contaminated turbine oil



3. Oil after processing

Final sample ISO Cleanliness Code was 15-13-10. This translates to 320-160 particles per milliliter larger than 4 mm; 80-40 larger than 6 mm; 10-5 larger than 14 mm

10, putting millions of dollars of equipment at risk.

Time and cost are major considerations during most outages. The optimal solution for Sam Rayburn was offered by Oil Filtration Systems Inc, Boerne, Tex, located about 150 miles up the road from the powerplant. Within a matter of hours, OFS had one of its Vacuum Dehydrator Oil Purification Systems (VDOPS) onsite. Its state-of-the-art filtration technology can reduce the amount of water in turbine oils to as low as 20 ppm and the concentration of particulates to meet or exceed new-oil cleanliness specifications—typically ISO 16/13/10 or better.

VDOP systems are simple to operate and require only electricity to remove particulates, dissolved gases, and water from oils. The equipment, virtually maintenance free, is designed both for fast hook-up and for 24/7 operation in outdoor environments.

Processing of the contaminated oil (Fig 1) began just before 8 p.m. the day OFS was called by STEC. The VDOPS (Fig 2) reduced the amount of water in the Sam Rayburn oil by 4000 ppm in the first hour, and in less than two days achieved 45 ppm (chart). During that time, particulate matter went from 18/16/14 to 15/13/10 (Fig 3).

These results were verified by OFS' onsite portable fluid analysis kit, which is used by technicians to chart progress and allow customers to see firsthand the improvement in the condition of their oil. Bishop said, "The Field Service Group of OFS was very knowledgeable about oil cleanliness standards and went above and beyond to get my turbine oil dehydrated and free of particulates."

VDOP systems are designed to work on wide range of fluids used in powerplants—including hydraulic and lubricating oils, diesel fuel, phosphate ester, transformer oil, etc. They can remove 100% of free and emulsified water from these fluids, as well as 90% of the dissolved water (down to 20 ppm). Regarding solid contaminants, particle counts as low as ISO 12/10/9 can be achieved with high-efficiency 2.5 Beta(c)>1000 filter elements.

In addition, the VDOPS can be equipped to remove varnish, acid, and entrained air or gas as required. OFS offers contract field services and equipment rentals, as well as purchase options. Several units are assigned to strategic locations to allow a rapid response for the company's field service business.

VDOPS processing quickly reduces the concentration of water in turbine oil

Day/time	Water, ppm
1, 1940	6000
1, 2040	1911
1, 2230	1469
2, 0050	740
2, 0230	711
2, 0445	506
2, 0650	291
2, 1030	175
2, 1330	104
3, 1500	45

Tracking cycles on LM engines an OEM requirement

The term "cycles tracking" got special emphasis in the plant manager's lexicon about seven years ago when the OEM assigned life limits to hot parts and required owner/operators to track engine cycles—specifically normal start/stop, trip from load, and partial cycles (step change). This followed a somewhat similar directive from the FAA for on-wing engines.

Goal: To achieve the highest level of operational safety by assuring that design-life limits of critical parts—rotors and disks, for example—are not exceeded. The editors were told by one attendee at last year's meeting that the requirement to track cycles is specified in engine O&M manuals. Some plants in the fleet are tracking cycles, but others still have no system in place for doing so.

Cycles tracking computer is small enough to hold in the palm of your hand

Rack space is not difficult to locate for such a small device

A panel was put in place by WTUI at the 2011 conference to find out how LM owner/operators were approaching the challenge. There were three participants: Ed Jackson of Missouri River Energy Services, Chris Heiberger of Wellhead Services Inc, and Dan Dowler of Encana Corp.

Each participant explained the system his plant had developed to track cycles. The approaches differed, but all three of the self-developed solutions achieved the objective by providing the information required. None of the panelists said his plant was replacing parts based on results, but it was obvious to one attendee with considerable knowledge on the subject that this was coming—sooner rather than later.

The same expert, while commending the plants for their initiative, suggested that the individual approach does not meet the intent of the directive because it's a fleet issue, not a customer issue. The proverbial fly-in-the-ointment is rotable parts. If the data have no pedigree, he said, you only will know the impact your operations have had on the lives of individual parts.

A better approach, he continued, might be to have an industry-wide data acquisition and analysis service track parts from plant to plant, machine to machine, and through repair processes. The service provider would alert owner/operators when parts in their machines were approaching end of life.

Early in 2012, the editors spoke with Larry Gasaway of Gasaway Engineering (see ad, p 42) who confirmed that GE had added a chapter to its O&M manual on critical parts life management. It says, in part, "Critical life-limited parts are those parts that, should they fail, could threaten the structural integrity of the engine or its package.

"Stress cycles on gas-turbine parts result from transients of speed and temperature that occur during starts, accelerations, and decelerations. Therefore, life limits are expressed in terms of engine cycles and can be related to normal operational data."

GE goes on to say that "cycles must be recorded and tracked for each critical life-limited part." Plus, "It is the owner's/user's responsibility to establish a tracking system to ensure that adequate records are maintained for each critical life-limited part and that no such part exceeds its life limit."

Gasaway said there is only one commercially available system for LM users to count and track their cycles. Because most users are still not tracking cycles, he continued, this could leave them open for risk. If a part were to fail, insurance companies would investigate and discover that the user was not complying with OEM guidelines, and that could affect how the insurer handles the claim.

Tracking cycles manually has its drawbacks. Operators can miss cycles, fallout of the habit of recording them, or calculate them incorrectly. Installing an automatic counter mitigates this risk; it runs in the background and counts cycles automatically. Additionally, it generates reports that can follow the life-limited parts through maintenance cycles, depots, and different owners as it gets repaired and rotated around.

The cycle counter offered by Gasaway Engineering is a small computer that can plug into most control systems through an Ethernet port on the control system's network (photos). It will interface with most control systems and makes the information available as OPC data. Then the computer automatically counts the cycles and makes the raw cycle data available as OPC data.

An Excel add-in from Gasaway Engineering allows Excel to read the OPC data and manipulate it as desired. As an additional benefit, this system will make other engine parameters available to be read by Excel and it can then be used for still other calculations and reports. Added options can include thrust-balance monitoring, temperature-spread monitoring for fuel-nozzle troubleshooting, and compressor efficiency.

Gasaway Engineering also can run historical data through its program, to count past cycles. Additional network ports can be installed to interface with other networks to store cycle reports on networked PCs, send the data to other PCs to run the reports from your office, or send the information as OPC data to your DCS for display on HMIs or to be archived with the plant's existing historian. If the plant doesn't have a historian, or wants to keep this separate, one can be loaded on this computer to archive parameters monitored by the cycle computer.

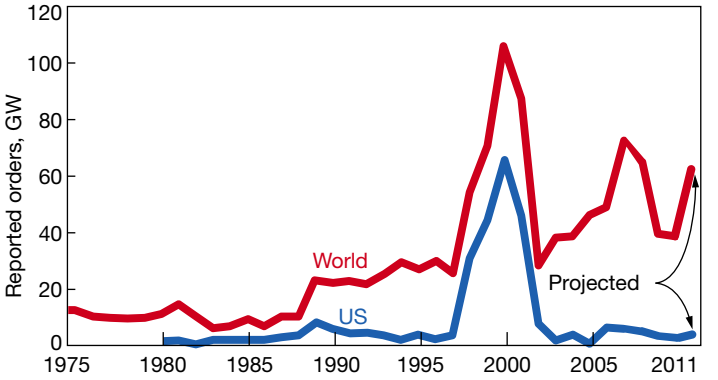
The Gasaway cycles counter was said to be meeting or exceeding expectations on two base-load LM2500s in Southern California and three LM6000s at a plant in the Midwest.

Strong rebound for GT orders in 2011

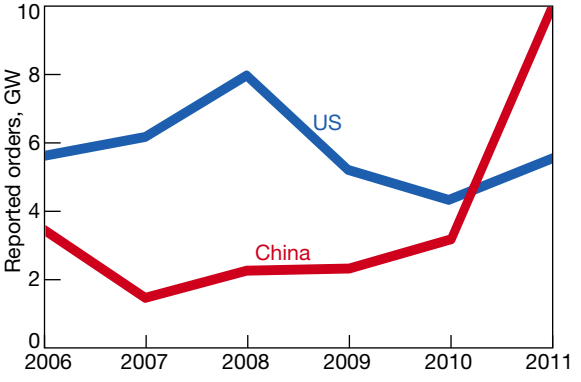
When WTUI met in Palm Springs last March, the gas-turbine business in the US was in tough shape. In fact, Mark Axford, principal, Axford Turbine Consultants LLC, Houston, summed up the situation by saying, "And you thought the housing market was lousy." US orders for gas turbines were at a five-year low. Worldwide orders for gas turbines, while up from 2009, also were at 2005 levels. The question asked at that time: "Is this the new normal or will 2011 bring a rebound?"

Axford predicted that 2011 GT orders would increase by 25% in the US, 15% worldwide. This upbeat forecast was based, in part, on the premise that the Japanese disaster at Fukushima would cause a reversal of the nuclear renaissance and boost gas-turbine sales not just in Japan, but in Europe and the Americas as well.

While attendees will not glimpse the final tabulation of 2011 year-end data until Axford takes the podium Tuesday morning at 8 a.m. in Ballroom D-E, extrapolation of information available at the end of last September indicate once again that the consultant may not be completely right all the time, but he's never wrong (charts, below).



Gas turbine orders worldwide and US for the last 36 years. Data from 1990 to date are for units larger than 10 MW



Reported orders of gas turbines rated more than 10 MW for the last five years shows China surging ahead of the US

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- Expanded company description
- Links to CCJ articles referencing your company
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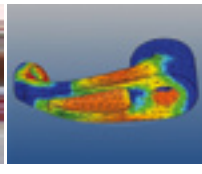
- Listing updates as your business evolves
- Outage season email blasts and print marketing promotion
- Keyword, category, and company searches bring plan



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WTUI's rich history

The Western Turbine Users Inc celebrates its 22nd anniversary this year. While there have been an incredible number of changes in the electric power industry since WTUI was founded, the organization's mission has never wavered. It remains: "To provide members a forum for the exchange of technical, operations, and maintenance information and experience to improve the reliability and economic viability of GE LM series power facilities."

If this is your first Western Turbine Users conference, it's difficult to imagine how much you have missed. Advice for first-timers: Attend the sessions and listen carefully, meet fellow users at social events, speak with vendors at the expo, and you'll leave Pasadena with more knowledge than you ever thought you could absorb.

WTUI veterans know that the success of this conference did not just happen by accident. The word "serendipity" does not apply to WTUI. Its success has been built on the efforts of dedicated people with vision and a long-term commitment to their industry—and to each other. Now, after 22 years of hard work, a meeting that started out in a few plant break rooms has been transformed into a world-class conference that attracts a global audience.

The first meeting of the incorporated organization was in Sacramento, March 1991. There were 130 registered attendees—including users, vendors, spouses, and guests. The Board included John Tunks, Ernie Soczka, Bob Fields, Jim Hinrichs, Wayne Kawamoto, and Steve Johnson. You'll find their names inscribed on the group's "Honor Roll," p 20.

At that meeting, Hinrichs became the WTUI president, a position he was to hold for 17 years. Other founding members of the organization who were present included Mike Raaker, Jack Dow, Jim Bloomquist, and Brian Hulse. You're sure to bump into several of these pioneers in the Pasadena Convention Center. When you do, please say "thank you."

Breakouts. From the beginning, the two and a half days of breakout sessions covering each LM product line have provided the foundation for sharing knowledge and solving problems. These invaluable sessions provide the opportunity for users to openly discuss installation and commissioning issues, O&M concerns, lessons learned, and the opportunities for plant improvements.

Technical discussion covers the engine, package, controls and all ancillary systems. The intent is to share and document, thereby creating a history through the notes of relevant and meaningful "real life" experiences to help the operating community improve as a group.

Over the years, discussion leaders for the breakout sessions have included Jimmie Wooten, Frank Oldread, Johnson, Grant McDaniel, Joel Lepoutre, Roy Burchfield, Norm Duperron, Mel Murphy, Bob Anderson, Charlie Hoock, Kevin Koszalka, James Hardin, Bob Mason, Rich Frank, Chuck Casey, Bob Nelson (now deceased), Chris Kimmich, Bill Lewis, John Baker, Bryan Atkisson, James Charles, Chuck Toulou, Don Haines, and Mark Breen.

The hard work and dedication of the discussion leaders is what makes the breakout sessions so successful and meaningful. Plus, the technical sessions have been strongly supported by GE and the Depots adding to their value. For the last several years the lineup of depots has been TransCanada Turbines, IHI, Avio, Air New Zealand (now ANZGT Field Services), and MTU Maintenance Berlin-Brandenburg.

The winds of change. WTUI conferences continue to grow annually, providing opportunities to renew old friendships and establish new ones. Equally important, the conference attracts a significant percentage of new users and attendees each year who bring fresh ideas and perspective vital to long-term health.

Continuing growth testifies to the Board's hard work and to the increasing value and need for face-to-face information exchange. Such success, however, brings change and occasionally presents very real challenges to the relatively small group of volunteers who make WTUI happen.

President Jim Hinrichs and the Board in place during the first few years of the new millennium faced significant challenges as the need for WTUI's services increased markedly while the duty cycle for the LM sector of the industry was migrating from base- to part-load generation and there was a question as to whether GE could continue to support WTUI with the same commitment as it had in the past.

The good news was growing conference attendance, which went from an average of 470 in the 1996-2000 period to 667 from 2001 to 2005. Since

Welcome exhibitors

Chuck Casey and Bill Lewis, the two officers of the Western Turbine Users Inc responsible for organizing the exposition, welcome and thank the exhibitors for their participation. Casey said more than 170 companies would be on hand in the Convention Center to display and explain their products and services from 5:30 p.m. to 8:30 Sunday evening and from 8:00 a.m. to 4:30 p.m. on both Monday and Tuesday. Casey added that there are more than 20 "new" exhibitors this year.

Six raffles highlight Sunday evening Welcome Reception

User members are urged to keep a sharp ear Sunday evening during the Welcome Reception from 5:30 to 8:30. A special raffle will be conducted at the top and bottom of every hour (users only!), beginning at 6 p.m. Here's the lineup of prizes:

6:00 p.m..... Portable hard drive
6:30..... $100 Visa card
7:00..... TomTom® XL GPS
7:30..... $100 Visa card
8:00..... Kindle Fire
8:30..... iPad 2 (16 GB, WiFi)

then attendance has averaged more than 800. With this success came the difficulties associated with venue selection; relatively few locations can accommodate groups of this size. Plus there were the additional workloads associated with registration, meeting attendee expectations, etc. More hands were needed; the volunteers could no longer do everything.

Both the organization and its owner/operator members also were forced to adjust to market influences. The once dominant cogeneration market was contracting; units were operating fewer hours per start and they were beginning to cycle. This market shift was chronicled by Charlotte-based Strategic Power Systems. A report presented at the 17th annual conference in Phoenix based on information retrieved from the company's ORAP® data collection and analysis system stated, "Two operating profiles are distinctly visible: A base-load duty between 1995 and 1999, and a cycling duty between 2002 and 2006. The years 2000 and 2001 appear to be a transition period where the shift in duty cycle began." Access the latest performance trends in SPS President Sal DellaVilla's article on p 28.

As the duty cycle was changing, the LM6000 and LM2500 solidified their positions as the product lines for growth, and component life, coatings, and emissions were the issues that had to be addressed.

Growth of Depot support. It was during the market evolution that GE communicated to the Board that it would not be able to sustain WTUI support at the same level as in the past. The Board took that in stride, solidifying its relationships with the Depots and redoubling its efforts to assure that the annual meeting's technical content, and the currency and relevancy of issues covered, would continue to meet expectations.

The formal event in Pasadena begins—as it has for years at other venues—on Sunday afternoon with the New User Orientation, which is followed by the opening of the exhibit hall. The goal of the session is to introduce first-timers to LM engines, terminology, nomenclature, and other hands-on knowledge and experience to prepare them for the discussions that would take place during the breakout sessions beginning the next day.

Monday morning the conference starts. The months of preparation by the Board, the breakout-session chairs, and the Depots kick the meeting into high gear.

WTUI President Jon Kimble and the Board work diligently and effectively to keep "the shine on the apple." Speakers like Mark Axford, principal, Axford Turbine Consultants LLC, Houston, who probably sold or directed the sale of most LM units when he was with Stewart & Stevenson, and for a time at GE, provides a "Worldwide Gas Turbine Business Update" that is second to none. Other presentations from the Depots and GE provide product updates that are both informative and responsive to user needs.

In the electric power industry, there are many conferences and user groups, all founded with a desire to add value. And they do. But WTUI is special. It is celebrating its 22nd anniversary not just because of the desire and need to share information and knowledge, but rather because it is genuinely focused on the user.

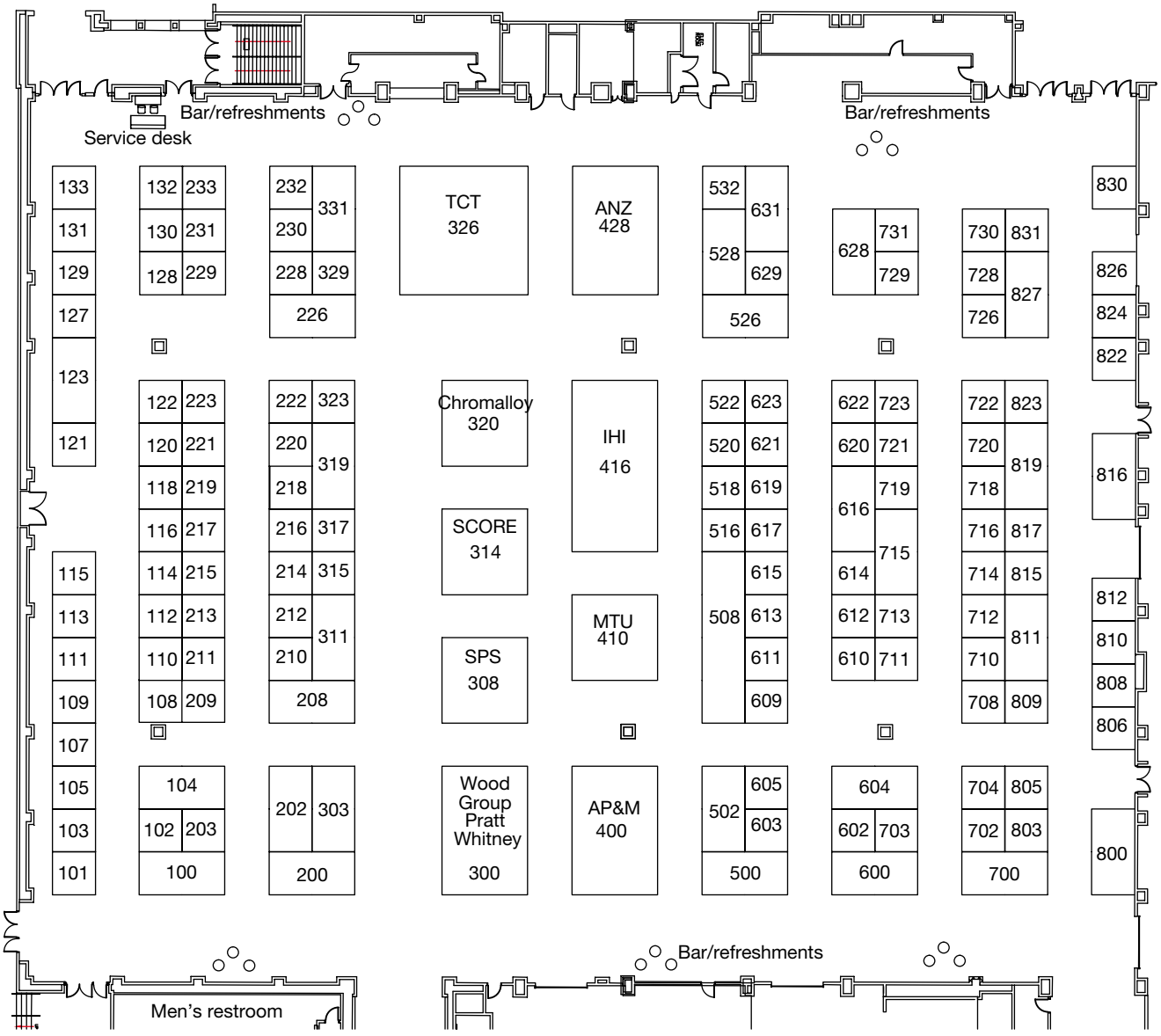

EXHIBIT HALL

Alphabetical order by company as of March 1

Company	Booth
A & I Accessory Ltd	502
AAF International	631
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Advanced Turbine Support Inc	603
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104	GE Power & Water
105	Braden Manufacturing LLC
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113	Gradient Lens Corp
114	Brush-GMS

Booth	Company
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Booth	Company
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233	Electrical Maintenance Consultants
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315	Express Integrated Technologies LLC
317	GasTOPS Ltd
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320	Chromalloy
323	CSE Engineering Inc
326	TransCanada Turbines Ltd
329	Rochem Technical Services USA Ltd
331	Advanced Filtration Concepts
400	ap+m (Aviation, Power & Marine Inc)
410	MTU Maintenance Berlin-Brandenburg
416	IHI Corp
428	ANZGT
500	Zokman Products Inc
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508	Aeroderivative Gas Turbine Support Inc
516	Quality Industrial & Marine
518	Turbine Technology Services Corp
520	Integrated Turbomachinery Inc
522	Jet Aviation Specialists Inc
526	Olympus
528	OEM Parts Network

Booth	Company
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603	Advanced Turbine Support Inc
604	HPI LLC
605	Duct Balloon/G R Werth & Associates
609	The Hilliard Corporation
610	TAS Energy Inc
611	Tech Development Inc
612	PAS Technologies Inc
613	Barnhart Crane & Rigging
614	Petrochem Insulation
615	Airgas West
616	ProEnergy Services
617	AMETEK Power Instruments
619	Caldwell Energy
620	Rhinestahl Corp
621	Camfil Farr Power Systems
622	Nationwide Boiler Inc
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628	PIC Group Inc
629	Clean Air Engineering Inc
631	AAF International
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702	Danfoss High Pressure Pumps
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Booth	Company
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716	HY-PRO Filtration
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830	Coverflex Manufacturing Inc
831	T2E3 Inc

SPONSORS

Alphabetical order by company as of March 1

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AFC-Advanced Filtration Concepts
Aeroderivative Gas Turbine Support Inc
Airgas Specialty Products
ANZGT
Avio
CSE Engineering Inc
Express Integrated Technologies LLC
GasTOPS Ltd
IHI Corp
Kellstrom Power Group
Maximum Turbine Support Inc
Meggitt
MT R&O LLC
MTU Maintenance Berlin-Brandenberg
OEM Parts Network LLC
Parker Hannifin Corp
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