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T2E3, Inc
Energy Efficiency
Enterprises

Experience 17 Years in the power generation and energy services industry

Education Master of Science in Mechanical Engineering,
University of Washington, 1994
Thesis Title: *Supersonic Diffusers in Dual-Mode Scramjet Engines*
Bachelor of Science in Mechanical Engineering
University of Washington, 1992

Registrations Registered Professional Engineer, Washington State

Summary of Expertise Mechanical Engineer with experience in power plant operations, commercial and thermal performance modeling, performance testing and performance monitoring software development and installation.

Serve as Test Director and Test Engineer on gas turbine simple cycle, combined cycle, cogeneration, and coal-fired boiler plant testing projects. Prepare and implement performance test procedures and models for testing. Implement performance test plans including installing test instrumentation, collecting and analyzing data, interfacing with the plant distributed control system (DCS) for downloading plant data during testing, and preparing and submitting final test reports.

Recently incorporated a successful sole-proprietorship into T2E3, Inc. - a business providing software and consulting services for the power generation industry. Responsible for the design, development, marketing, sales, installation, training and support of performance monitoring packages for new and existing clients. Also develop material and serve as instructor for the T2E3 Performance Seminar Series for power generation equipment.

Related Experience **Complete Test Services for the WMMPA Exira Power Station**
Exira consists of 2 LM6000 PC SPRINT GT's in simple cycle with a central Chiller Package for inlet cooling and dual fuel capability. Served as Test Director and Test Engineer during the performance tests in early spring and also ran a dedicated Chiller Package Test in mid summer. The chiller test was completed separately in order to find a day hot and humid enough to provide the chilling load needed to prove out the chillers.

Seminar Developer and Instructor: LM6000 Performance Characteristics, Testing and Long-Term Condition Monitoring

Developed and maintain the material for the seminar. Serve as Instructor to present the seminar annually. Seminar is focused on LM6000 performance including the application of Throttle Push Corrections. Material also covers PTC 22, test uncertainty and how to effectively test and monitor gas turbine performance.

Served as Owner's Engineer for the Griffith Energy Project

During the 2001 startup of the GE7FA 2x1 plant, supported all Owner's interests during startup, including test coordination meetings and reviews of procedures and performance analysis results. When test results showed gas turbines were short on performance, brought in additional instrumentation which proved the apparent

performance loss was due to imbalances in the chiller coil coolant flow. The test instrumentation was used to balance the chillers, resulting in improved overall plant performance. I continue support long-term performance monitoring at Griffith.

Compressor Water Wash Performance Tracking Software

Developed a compressor water wash tracking software program using Microsoft's .NET platform and the SQL Express database. Software allows users to input operating data for a gas turbine compressor, then analyzes the performance of the compressor over time to determine the economic impact of a water wash, and to make recommendations for adjustments to the water wash schedule based on actual data.

Trader's Dispatch Model

Used Visual Basic and Microsoft Excel to design, build and run models to determine the break-even price of generation for use in both day-ahead and real-time energy trading. Model included a method to determine the cost savings for running facilities in base load versus peaking operation.

Commercial Cost Model

Used Visual Basic and Microsoft Excel to design, build and run cost analysis models for 16 DuPont manufacturing sites in preparation of an AEP/Conoco/DuPont joint venture. Cost models were used to determine errors or omissions in plant operating data as well as to find potential savings in operating costs. Equipment modeled included boilers, steam turbines, air compressors, DP:DPO vaporizers, cooling towers, condensers, pumps and chillers.

Major Maintenance Schedule Program

Developed a program using Microsoft Excel and Visual Basic to schedule the major maintenance of industrial gas turbines. The program calculates total lifetime equipment costs using the manufacturers' data for maintenance intervals and pricing options as input by the user. The program is able to capture the savings of spare parts rotation schedules as well as pricing discounts and international fees.

Employment History	<p><u>T2E3, Inc. - Kirkland, WA</u> President and Principal Engineer; October 1, 2010 to Present</p> <p><u>T2E3 - Kirkland, WA</u> Sole-Proprietor and Principal Engineer; January 1, 2007 to September 30, 2010</p> <p><u>McHale & Associates, Inc. - Sammamish, WA</u> Manager, Performance Monitoring, 2005 to 2006; Principal Engineer, 2002 to 2005; Sr. Engineer, 2000 to 2002; Associate Engineer, 1995 to 1997</p> <p><u>Puget Sound Energy - Bellevue, WA</u> Project Manager, 1999 to 2000</p> <p><u>Operational Energy Corporation (an Enron Company) - Redmond, WA</u> Operations Engineer, 1998 to 1999</p> <p><u>E.I. DuPont de Nemours and Company - Waynesboro, VA</u> Power Engineer, 1997 to 1998</p> <p><u>Raytheon Constructors Inc./Plant Services - Bellevue, WA</u> Associate Engineer, 1994 to 1995</p>
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Computer Programs / Languages	<p>GE Enter's GateCycle, Visual Studio .NET: C++, C#, Visual Basic; HTML, Microsoft Office Applications (Excel, Word, Power Point, Access) and VBA, Fortran and Adobe Acrobat</p>
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Professional Affiliations American Society of Mechanical Engineers, Member
 ASME Standards Committee Member
 ASME PTC 51: Combustion Turbine Inlet Air Conditioning Equipment; Member
 ASME PTC 70: Ramp Rates; Member
 ASME PTC 102: Operating Walkdowns Guideline; Member
 ASME PTC-PM: Performance Monitoring Guideline; Vice-Chair
 Tau Beta Pi; Lifetime Member

Publications "Energy Efficiency by Optimizing Annual Testing Schedules – Coordinating RATA Testing with other Annual Test Requirements"; T.L. Toburen (T2E3), Allen Kephart (Clean Air Engr), Rhonda Walker (GSE Systems), ASME Power Conference Proceedings, 2009

"Incremental Heat Rate and Optimization – New Applications for ASME PTC-PM Performance Monitoring Guideline"; T.L. Toburen (T2E3), Sam Korellis (EPRI), Joe Milton (Reliant), ASME Power Conference Proceedings, 2008

"Monitoring Compressor Efficiency for Maximum Performance"; T.L. Toburen (T2E3), PowerGen Conference Papers, 2007

"How to Conduct a Plant Performance Test"; T.L. Toburen and L.B. Jones (McHale & Associates, Inc.), Power Magazine, September 2006

"Managing Power Generation Assets to Maximize Profits"; T.L. Toburen (McHale & Associates, Inc.), www.EnergyPulse.net, 2004

"A Long Term Assessment of Plant Performance,"; M.P. McHale, T.L. Toburen (Raytheon Engineers & Constructors), T. Miller, T. Grigg (Lone Star Energy), ASME, 1995

Project List The following is a partial list of projects where involvement has included (1) modeling and analyzing performance, (2) providing on-site testing instrumentation and support and/or (3) modeling and software for real-time monitoring and reporting functions.

Item	Project	Location	Client	Size-MW	Description
1,2,3	Arlington Valley	Maricopa County, AZ	D-FD and Dynegy	980	2x1 GE7FA Gas Turbine Combined Cycle
1,2,3	Eastex	Longview, TX	AEP-Proserv	500	2x1 GE7FA Gas Turbine Combined Cycle
1,2,3	Griffith	Kingman, AZ	DENA and Dynegy	590	2x1 GE7FA Gas Turbine Combined Cycle.
1,2,3	Perryville	Monroe, LA	Central Louisiana Electric Company (CLECO)	562	2x1 GE7FA Gas Turbine Combined Cycle
1,2,3	Reid Gardner	Moapa, NV	Nevada Power Corp.	655	Coal Fired Plant
1,2	Orange Grove	Pala, CA	Industrial Construction Company	100	2 x GE LM6000 Gas Turbine Peakers w/ inlet chillers and gas compressors
1,2	Bastrop	Austin, TX	Duke Fluor Daniel (D-FD)	536	2x1 GE7FA Gas Turbine Combined Cycle
1,2	Coyote Springs	Boardman, OR	Portland General Electric	217	1x1 GE7FA Gas Turbine Combined Cycle
1,2	Exira	Exira, IA	R.W. Beck / WMMPA	96	2 x GE LM6000 Gas Turbine Peakers with inlet chillers & duel fuel
1,2	Kendall	Kendall County, IL	NEPCO and Dynegy	1160	4, 1x1 GE7FA Gas Turbine Combined Cycle Plants

Project List (Continued)

1,2	Murray	Dalton, GA	Duke Fluor Daniel (D-FD)	1150	2, 2x1 GE7FA Gas Turbine Combined Cycle
1,2	Orange Grove	Pala, CA	Industrial Construction Company	95	2 x GE LM6000 SPRINT Gas Turbine Peakers with inlet chillers
1,2	Ouachita	Sterlington, LA	National Energy Production Co. (NEPCO)	726	3, 1x1 GE7FA Gas Turbine Combined Cycle
1,2	Red Oak	Sayreville, NJ	Washington Group International, Inc.	760	3x1 W501FD Gas Turbine Combined Cycle Plant
1,2	Sugarcreek	Sugarcreek, IN	Mirant	320	2x1 GE7FA Gas Turbine Simple Cycle
1,2	Tallahassee	St. Marks, FL	Washington Group International, Inc.	230	1x1 GE7FA Gas Turbine Combined Cycle
1,3	Cottonwood	Deweyville, TX	McHale Performance and Kelson Energy	1279	4, 1x1 GE 7FA combined cycle facility
1,3	Dogwood	Pleasant Hill, MO	McHale Performance and Kelson Energy	625	2x1 W501FD2 combined cycle facility
1,3	GTAA	Toronto, Canada	SNC Lavalin Profac	117	2x1 GE LM6000PD combined cycle, cogeneration with central CHP plant
1,3	Hermiston	Hermiston, OR	Hermiston Generating Company	500	2x1 GE7FA Gas Turbine Cogeneration
1,3	La Paloma	Bakersfield, CA	Complete Energy, LLC	800	4, 1x1 Alstom GT24 Gas Turbine Combined Cycle plants
1,3	Magnolia	Benton County, MS	McHale Performance and Kelson Energy	968	3, 1x1 GE 7FA combined cycle facility
1,3	Orange	Bartow, FL	Orange Cogeneration Associates	120	2x1 GE LM6000 Gas Turbine Combined Cycle
1,3	Panoche	Firebaugh, CA	PPMS / Wood Group	400	4 x GE LMS100 Gas Turbine Peakers
1,3	Sundance	Casa Grande, AZ	Arizona Public Service	500	10 x LM6000 Gas Turbine Peakers
1	AMEA	Sylacauga, AL	AMEA	100	2 x LM6000 Gas Turbine Peakers
1	Barney M Davis	Corpus Christi, TX	Topaz Power Group	679	2x1 GE 7FA combined cycle
1	Cheswick	Cheswick, PA	MPR Associates, Inc.	600	GE Steam Turbine
1	Laredo	Laredo, TX	Topaz Power Group	190	2 x GE LMS100 Gas Turbine Peakers
1	Macaé	Brazil	Universal Energy, Inc.	720	16 x LM6000 Gas Turbine Peakers
1	Nueces Bay	Corpus Christi, TX	Topaz Power Group	677	2x1 GE 7FA combined cycle
1	Penuelas	Puerto Rico	National Energy Production Co. (NEPCO)	510	2x1 W501F Gas Turbine Cogeneration
1	Sweeny	Old Ocean, TX	Industry & Energy Associates, Inc. (IEA)	480	4x1 W501D5 Gas Turbine Cogeneration Plants
3	Plus Petrol	Argentina	Stewart & Stevenson Operations	150	Gas Turbine Simple Cycle; Reporting System
3	Wind Power	San Geronio, CA	FPL	30	Wind Power; Reporting system