

Tina L. Toburen, P.E.
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T2E3
Energy Efficiency
Enterprises

Experience 15 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.

Currently a Sole-Proprietor, operating T2E3, a business providing software and consulting services for the power generation industry. As Owner and Principal Engineer, 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.

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.

Related Experience **Compressor Water Wash (CWW) 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.

Thermal Economic Monitor and Performance Optimizer (TEMPO®)

Prior to leaving McHale Performance in 2006, was personally responsible for directing, developing and improving the McHale TEMPO software products. Products model the performance and efficiency of gas turbines, boilers and steam generators, steam turbines, pumps, fans, condensers, cooling towers, compressors and chillers.

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 T2E3 - Kirkland, WA

History Sole-Proprietor and Principal Engineer; January 1, 2007 to Present

McHale & Associates, Inc. - Sammamish, WA

Manager, Performance Monitoring, 2005 to 2006; Principal Engineer, 2002 to 2005; Sr. Engineer, 2000 to 2002; Associate Engineer, 1995 to 1997

Puget Sound Energy - Bellevue, WA

Project Manager, 1999 to 2000

Operational Energy Corporation (an Enron Company) - Redmond, WA

Operations Engineer, 1998 to 1999

E.I. DuPont de Nemours and Company - Waynesboro, VA

Power Engineer, 1997 to 1998

Raytheon Constructors Inc./Plant Services - Bellevue, WA

Associate Engineer, 1994 to 1995

Computer Programs / Languages 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

Professional Affiliations Member, American Society of Mechanical Engineers
Member, PTC 51: Combustion Turbine Inlet Air Conditioning Equipment
Member, PTC 70: Ramp Rates
Vice-Chair, PTC-PM: Performance Monitoring Guidelines for Steam Power Plants,
Lifetime Member, Tau Beta Pi

Publications "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	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
1,2	Kendall	Kendall County, IL	NEPCO and Dynegy	1160	4, 1x1 GE7FA Gas Turbine Combined Cycle Plants
1,2	Murray	Dalton, GA	Duke Fluor Daniel (D-FD)	1150	2, 2x1 GE7FA Gas Turbine Combined Cycle
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	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	Orange	Bartow, FL	Orange Cogeneration Associates	120	2x1 GE LM6000 Gas Turbine Combined Cycle
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	Cheswick	Cheswick, PA	MPR Associates, Inc.	600	GE Steam Turbine
1	Macaé	Brazil	Universal Energy, Inc.	720	16 x LM6000 Gas Turbine Peakers
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	LG&E	Buffalo Ridge	LG&E Windpower Partners	30	Wind Power; Reporting system
3	Plus Petrol	Argentina	Stewart & Stevenson Operations	150	Gas Turbine Simple Cycle; Reporting System