



Occupational Health and Safety Research Program (Program 62)

Gabor Mezei, MD, Ph.D.
Program Manager

EEL Occupational Safety and Health Conference
New Orleans, Louisiana
April 27, 2010

EPRI OH&S Program

Mission

Provide tools that enable our members to maintain a healthy workforce and safe work environment

Scope

Occupational Injury Surveillance
Ergonomics Research
Occupational Exposure and Health

Employees are the most important assets of any company

Occupational Health and Safety Database

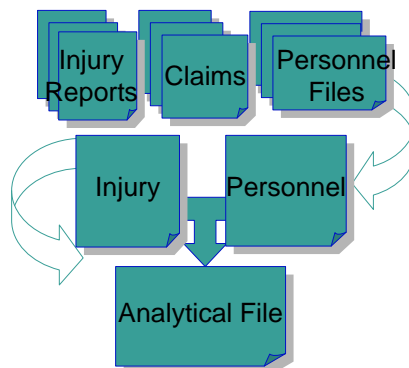
EPRI Occupational Health and Safety Database

Objectives

- Monitor injury trends
 - Standardize data
 - Quantify lost time & cost
 - Identify predictors
 - Strong analytical capability
 - Long-term & industry-wide perspective

Current Status

- Data from 17 utilities
 - ~1,500,000 person-years
 - ~52,000 recordable and lost-time injuries
 - 1995-2008



EPRI OHSD Components & Confidentiality Issues

Components

- Continual Recruitment
- Annual Update of Database
- Annual Report
- Tailored Collaboration Projects
- Focused Special Analyses

Confidentiality issues

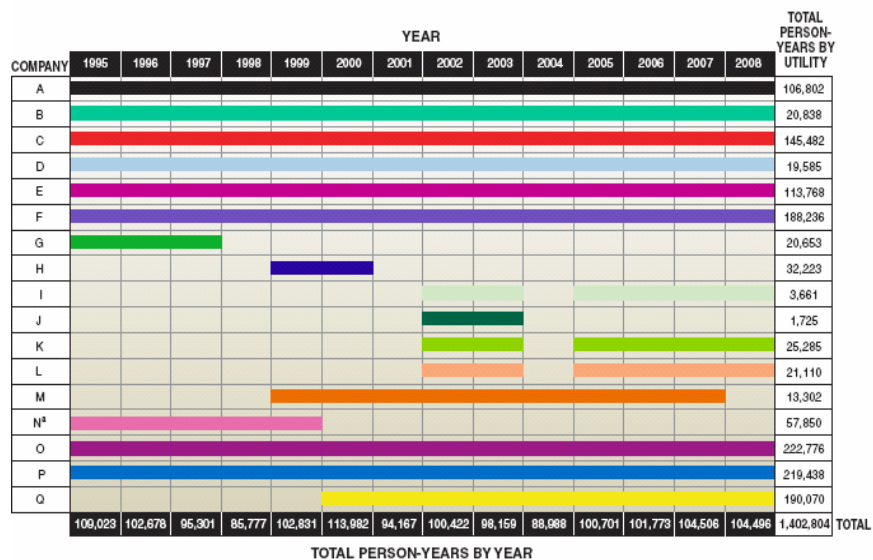
- Appropriate use of data
- Access to other researchers
- Reporting of events
- Identifiers removed
- Summary data set (not individually reported)

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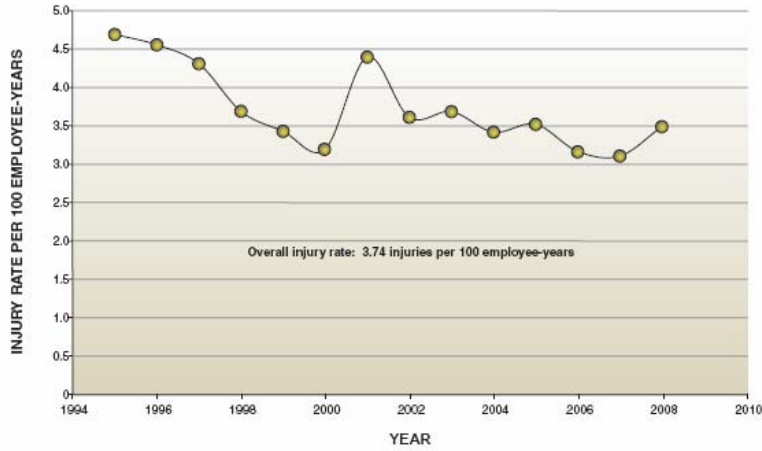
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Years during which participating companies contributed data, 1995–2008

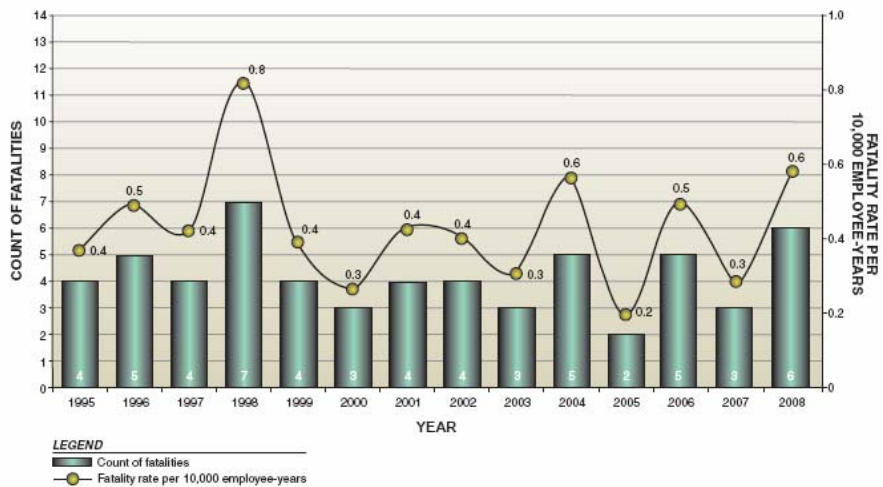


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Overall Injury Rates by Year, 1995–2008



Distribution and Fatality Rate by Year, 1995-2008



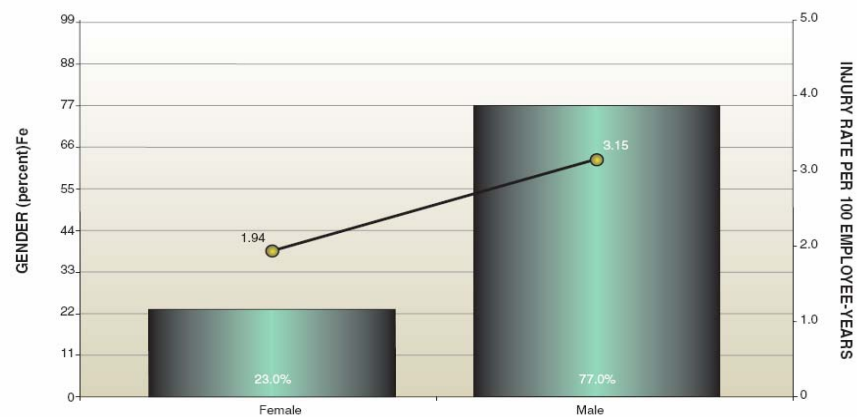
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Number of lost time and recordable injuries and employee-years, injury rate, and FTE loss rate by job classification, 1995–2008

Job Classification	Number of Employee-Years	Number of Injuries	Injury Rate per 100 Employee-Years*	Number of FTEs Lost	FTE Loss Rate per 10,000 Employee-Years
Administrative Support	74,779	1871	2.23	76.35	10.21
Coordinators	34,227	477	1.39	16.97	4.96
Custodians/Cooks	5,565	248	4.46	9.75	17.53
Drivers/Deliverers/Inspectors/Patrol	19,207	675	3.51	60.33	31.41
Electricians	39,207	1883	4.80	75.16	19.17
Engineers	89,988	708	0.79	10.90	1.21
Foreman	13,832	744	5.38	34.33	24.82
Line Workers	79,053	9254	11.71	405.90	51.35
Machinists	11,275	722	6.40	25.16	22.32
Maintenance Workers	76,380	4025	5.27	133.40	17.46
Managers	96,131	480	0.50	9.55	0.99
Material Handlers and Porters	21,328	1205	5.65	47.00	22.04
Mechanics	95,761	7171	11.88	259.06	27.05
Meter Readers	49,959	6828	13.67	290.03	58.05
Other	25,278	246	0.97	4.74	1.88
Other Technicians	47,800	1729	3.62	41.78	8.74
Plant and Equipment Operators	99,625	3792	3.81	105.70	10.61
Representatives	91,054	1790	1.97	166.98	18.34
Security	16,003	548	3.42	40.68	25.42
Supervisors	100,391	1894	1.89	79.28	7.90
Technical/Professional Support	229,034	2976	1.30	88.39	3.86
Welders	5,935	907	15.28	14.66	24.71
Grand Total	1,321,812	49,973	3.78	1,996	15.10

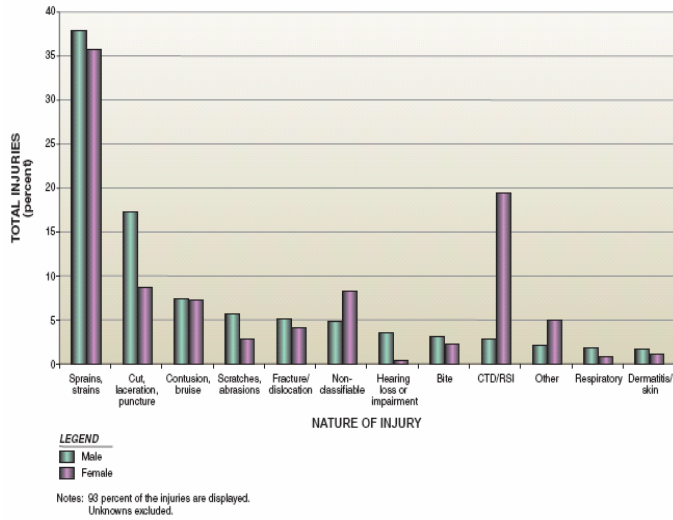
Distribution and Injury Rate by Gender, 1995-2008



LEGEND
 Distribution of gender
 Injury rate per 100 employees

Notes: Does not include data from Company N.
 The distribution is based on employee-years data and includes all employees.

Patterns of Injuries by Gender, 1995-2008

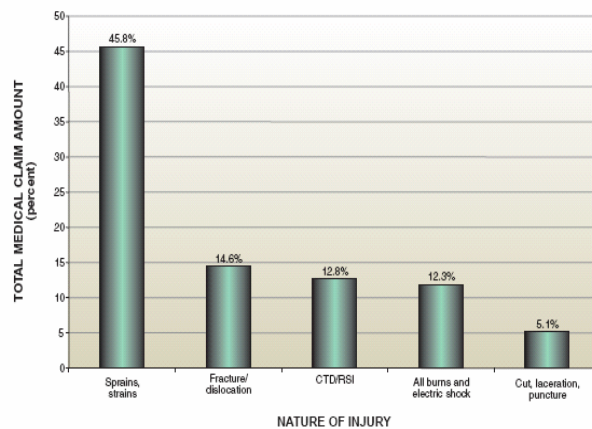


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Medical Claims Costs, 1995-2008



Notes: ¹ Around 90 percent of the total medical claim amount is presented in the chart.
² Does not include data for Companies H, J, and N and P for all years, and A, B, C, D, I, K, and L for 2006-2008. Unknown and nonclassifiable injuries excluded.

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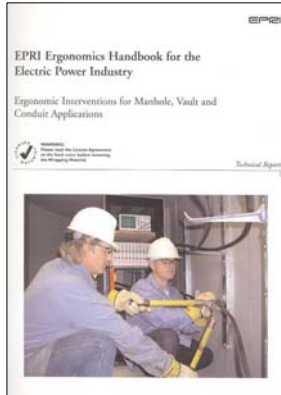
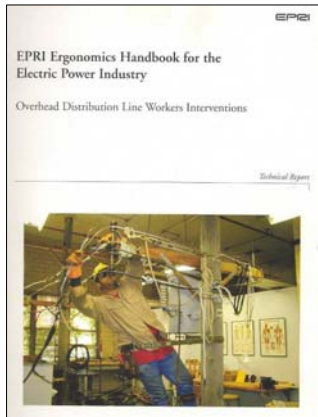
Special Activities and Projects

- Reliability measures and injury data
- Leading indicators (predictive of injury)
- Neck injuries among electric utility workers
- Ergonomics intervention study, launched Feb 2010

Ergonomics

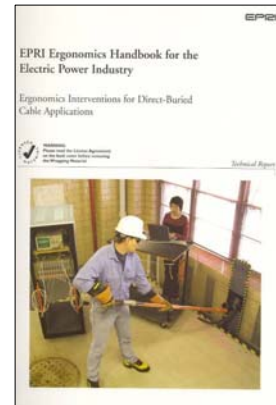
Ergonomics Handbooks – Distribution

EPRI Report
#1005199
November 2001



EPRI Report
#1005430
March 2004

EPRI Report
#1005574
March 2005



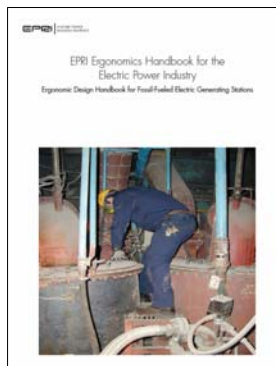
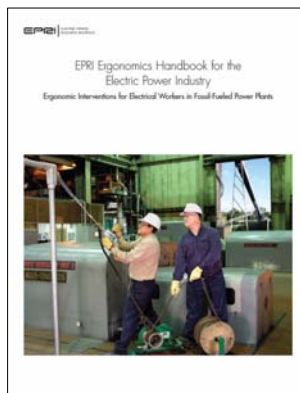
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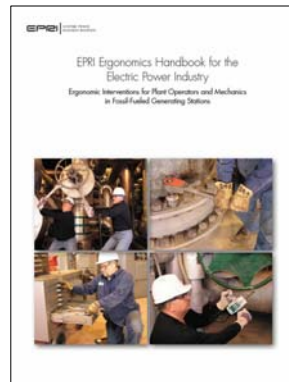
Ergonomics Handbooks – Generation

EPRI Report
#1014042
January 2009



EPRI Report
#1014942
March 2008

EPRI Report
#1015631
November 2008



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Ergonomics Instructional DVD

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- Changing Generator Brushes
- Crimping Connectors
- Cutting Wire/Cable
- Installing/Removing Temporary Wire/Cable
- Installing/Removing Wire Nuts
- Locating Electrical Boxes
- Moving Heavy Equipment Up/Down Stairs
- Moving Heavy Loads On Carts
- Moving Large Breakers
- Pulling Cable Through Conduit
- Racking Breakers
- Removing/Installing Load Center Breakers
- Replacing Suspension Insulators in a Precipitator
- Tightening/Loosening Small Fasteners



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Ergonomic Interventions for Electrical Workers in Fossil-Fueled Power Plants
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Ergonomics Supplemental Projects

Design of Electric Industry Substations for Enhanced Ergonomics and Worker Safety



Ergonomic evaluations of substation operations and maintenance identify risk factors for injuries and offer recommendations for substation design modifications to improve safety and working conditions.

Ergonomics of Vegetation Management Tasks



Vegetation management is critical to utility operations but high risk for worker health and safety. There is vegetation management and/or use of one pole to cut a branch with a manual saw. The worker is required to bend and create his hand assembly to cut limbs from a bucket which could result in injury and lost work time.

Ergonomics and Worker Safety for Construction, Operation and Maintenance of Wind Turbines



- Identify how construction of wind turbines contributes to risk factors for injury
- Target key factors for injury involved with operations and maintenance of wind turbines
- Minimize risk of injuries among energy workers related to construction, operation and maintenance of wind turbines

Wind energy is rapidly growing worldwide. According to the World Wind Energy Association, worldwide capacity is nearly 100 GW, with more than 28 GW added in 2009, a growth rate of approximately 32%. Moreover, the United States continues to lead the world in terms of installed capacity by a factor of 2.5.

1. Identify specific ergonomic-related problems that may arise during wind project construction and a range of wind project physical configurations
2. Generate ideas for ergonomic interventions, which may be evaluated in the field

Ergonomic Design of Fleet Vehicles

Background

- \$10-\$100M annual cost per company
 - Purchase & upfit
- Motor vehicles are major contributors to occupational injuries
- Problems
 - Users not involved at purchase/retrofit
 - Insufficient process for selection and purchase
 - Lack of ergonomics guidelines for fleet vehicle designs



Poor ergonomics can be costly

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Ergonomic Design of Fleet Vehicles

Objectives

- Ergonomic design specification
- Systematic process to select, purchase and maintain fleet vehicles
- Two handbooks
 - Ergonomic design of vehicles
 - Process guideline

Timeline

- 2008-2012



Poor ergonomics can be costly

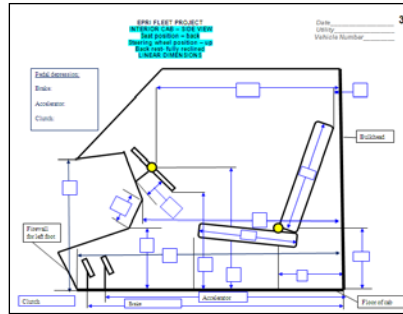
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Fleet Vehicle Ergonomics

- Define users' needs
 - Anthropometry
 - Mobile computer study
 - Ingress and egress
- Define needs of utility
 - Minimize overall cost
 - Standardize
 - Affect process development
- Establish guidelines for design and process
 - Decision models
 - Critical dimensions (cab, storage, maintenance, information tech)



Issues Affecting Postures

Room for Stomach



Room for Knees



Storage



Room for Feet



Laptop PCs and MDTs



Anthropometry Study

- 187 Utility Workers
 - Mostly male
 - 2 Midwest Utilities
 - 1 Southwest Utility
- Data collected from June 2009 to January 2010
- Compared data to several conventional anthropometry databases
- Results
 - On average, utility workers are taller and heavier than the general population

Mobile Computer Laboratory Study

- To reduce injuries,
 - Which laptop mounts to purchase?
 - Where to position laptop wrt driver?
- Laboratory set-up at Marquette U
 - Full-Size Chevy 1500 Silverado cab in lab
 - 4 to 5 complete laptop PC mounts from Gamber-Johnson
 - Gamber-Johnson has over 50% market share
- Methods
 - Evaluate mounts on task by task basis using biomechanical measurements



Ingress/Egress Study



- Worker falls from vehicles result in injuries
- Factors identified:
 - Steps too narrow and no overhang
 - No handle bar for descent
- Recommendations made in progress report (Progress Report, Prod ID: 1017995)
- Next steps:
 - Visit with manufacturers
 - Evaluate bucket ingress/egress

Occupational Exposure and Health

Welding Fume Studies

Background

- 2006 OSHA **Hex Chrome** Exposure Standard
 - Engineering exposure controls by 2010
 - Requires exposure determination
 - Measurements **or** use of “objective data”

Project Objective

- Assemble usable and useful “objective data”
- Appropriate documentation
- Categories by all relevant characteristics
 - E.g., welding or cutting, chrome content of base metal and welding consumable, worker orientation, job description, ventilation, arc time, voltage
- Final Report Dec 2009 (PID 1019015)

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Types of Welding and Distribution of Personal Air Breathing Samples



SMAW (63%)



GTAW (16%)



FCAW (2%)



GMAW (7%)

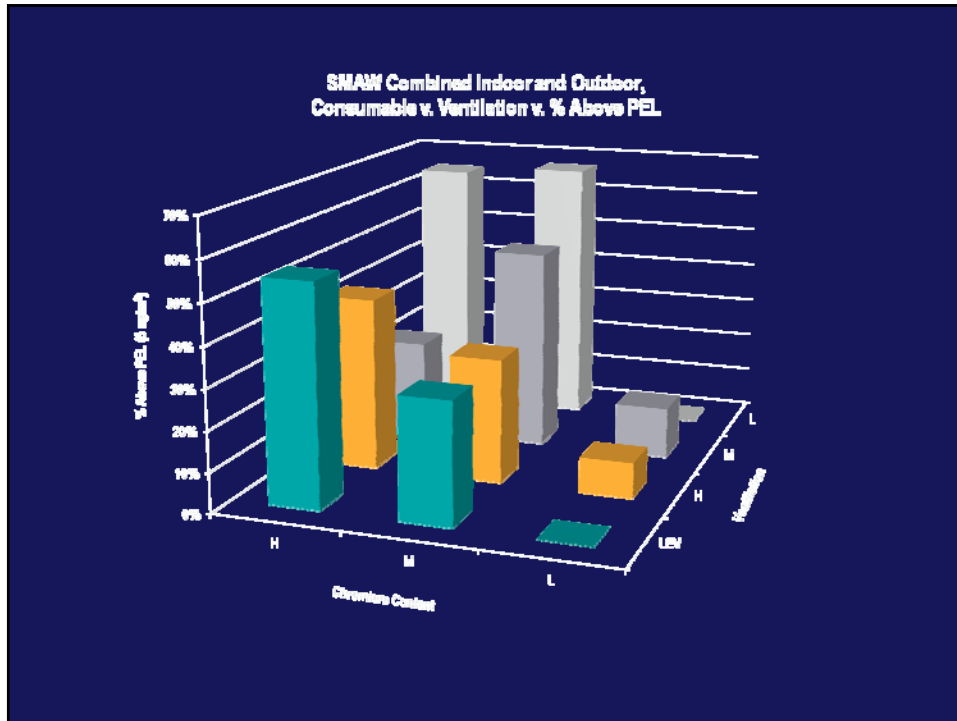


Arc Gouge (10%)

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Welding Fumes Study

2010 and Beyond

- Local exhaust ventilation (LEV) assessment
 - Ineffective if not used properly
 - Perceived obstacles for use of LEV
 - Potentially interferes with shield environment
 - Poor quality welds
 - Future work will address these issues, resulting in:
 - Technical report
 - Training video of proper LEV use
- Multiple metal exposure database
 - Will accrue data on exposures and modifying factors for other metals (e.g., manganese, beryllium)
 - Expansion of hex chrome work

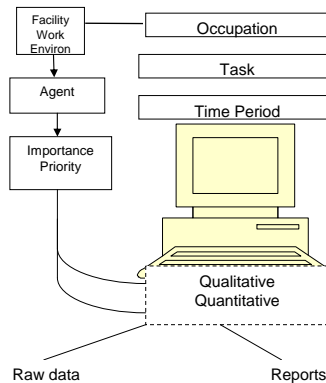
Comprehensive Utility Exposure Database

Start in 2010

- Database for occupational exposures in the electric power industry
 - Comprehensive
 - Flexible
- Aids hazard identification/exposure characterization
- Expands on previous work (e.g. welding studies)
- Benefits
 - Leverages industrial hygiene sampling data of individual companies
 - Arms industry with rapid response data for future regulations
 - Identifies data gaps in exposure monitoring
 - Creates means to evaluate exposure controls and interventions

Comprehensive Utility Exposure Database

- Joint NIOSH-EPRI workshop (Feb 2010)
 - Industry and academia
 - Identified exposure database as a business need
 - Job exposure matrix as an output
 - Outlined design strategies
 - Fostered potential future partnerships
 - Input existing NIOSH data into the database
 - Obtained NIOSH Integrated Hazard Exposure Database
 - Created for IH input
 - Modifiable for utility industry



Thank you!

Contact Information

Gabor Mezei, MD, Ph.D.,

Program Manager

Electric Power Research Institute (EPRI)

3420 Hillview Avenue

Palo Alto, CA 94304

www.epri.com

Phone: (650) 855-8908

gmezei@epri.com