

PLANT PROCEDURE ENGINEERING SUPPORT

Nuclear Industry Engineering Services



Volian Enterprises, Inc. is a leader in providing quality engineering services to the nuclear industry. We are widely recognized for our procedure development expertise, our knowledge of nuclear plant system interaction in response to postulated events, and our effective support of nuclear plant operations.

Since our formation in 1984, Volian Enterprises has been recognized for our ability to provide engineering and procedure services in a cost effective manner while meeting our customers' highest expectations.

Volian personnel were heavily involved with the development of the Westinghouse Owners Group (WOG) Emergency Response Guidelines (ERGs) while with Westinghouse prior to 1984. This involvement included a primary role in establishing the ERGs analyses basis that was required after the event at TMI Unit 2 in 1979.

Volian is recognized world-wide as a leader in developing accident management strategies for nuclear power plants. Volian provided consulting support in the Ukraine for Russian designed VVER pressurized water reactors where complete Analytical Justification of the plant EOs were developed. Volian has also participated in a project for the British government in Eastern Europe to develop Severe Accident Management Guidelines for a Russian RBMK designed reactor, similar to Chernobyl. Note that this plant's containment design was very similar to a BWR pressure suppression containment design. We have also worked with Mitsubishi Heavy Industries (MHI) to developed generic Emergency Operating Procedures for their U.S. Advanced PWR design.

Volian was one of the first contracting firms to successfully complete a full-scope Severe Accident Management Guideline (SAMG) development project for the Prairie Island Nuclear Power Plants. The value of employing Volian's expertise in developing procedures, setpoints and computational aids has led to our involvement with similar projects for Wisconsin Electric Power Company and Rochester Gas & Electric.

Volian's experience supporting Accident Management Procedures naturally leads to our ability to support all aspects of post-Fukushima procedure efforts. Volian currently has projects to calculate FLEX Support Guideline (FSGs) setpoints for a number of plants.

The vast majority of our work has been directly supporting our electric utility customers. On occasion we have performed specialized emergency management support for government agencies.

Our technical expertise in the areas of instrument channel accuracy and procedure setpoint development is reflected by the large number of setpoint documentation sets at plants across the United States with the Volian name on them.

Our dedication to the highest level of customer support and satisfaction is unparalleled, as demonstrated by our years of success in the most heavily regulated commercial industry in the World. Our successful support of our customers' needs is demonstrated by repeat or follow-up work at many utilities.

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VOLIAN ENTERPRISES, INC.

Volian Industry Presence

Volian Enterprises, Inc. is a recognized industry leader in providing quality engineering services and software solutions to nuclear power plants. The company was started in 1984 primarily to assist nuclear plants in upgrading their EOPs to comply with the numerous regulatory requirements imposed following TMI. Since that time, Volian Enterprises has provided its engineering and software development services to the following utilities:

Ameren-UE – Callaway
 American Electric Power – D.C. Cook
 Central Maine Power – Maine Yankee
 Constellation Energy Group - Calvert Cliffs & R.E. Ginna
 Dominion Generation – Surry & North Anna & Kewaunee
 Duke Power Company – Catawba & McGuire
 Entergy – ANO Unit 1 and Unit 2
 Entergy – River Bend & Waterford
 Entergy Nuclear Northeast – Indian Point Unit 2 & 3
 Exelon Generating Company, LLC–Braidwood & Byron & Zion
 Florida Power & Light - Turkey Point & Seabrook & Point Beach
 Prairie Island
 Pacific Gas & Electric – Diablo Canyon
 Progress Energy – H.B. Robinson & Shearon Harris
 South Carolina Gas & Electric - V. C. Summer
 Southern California Edison – San Onofre
 Southern Nuclear Operating Company – Farley & Vogtle
 STP Nuclear Operating Company - South Texas
 Luminant - Comanche Peak
 Wolf Creek Nuclear Operating Corp. – Wolf Creek
 Xcel Energy
 Yankee Atomic – Yankee Rowe

Volian has also provided consulting services to the following non-utility clients:

Mitsubishi Heavy Industries
 Scientech, Inc. /Curtis Wright Corp.
 U.K. Dept. of Trade & Industry (DTI)
 U.S. Department of Energy
 Dames & Moore
 Electric Power Research Institute
 Lancaster Exchange
 Lancaster County Health Plan
 Richardson & Estes

Accident Management Procedure Upgrade

In recent years, industry procedure upgrade programs have emphasized the upgrade of maintenance, normal and abnormal operating, surveillance test, and alarm/annunciator procedures. This is, in part, a result of the realization that plant procedure quality contributes to the overall reliability of the plant! Volian can provide full or partial procedure upgrade program support at a highly economical price. In addition to our direct project work, our involvement with our procedure maintenance software VE-PROMS, exposes the Volian staff to many utility approaches to a wide assortment of procedures. This is especially true as plants expand the use of our software product to more sets of plant procedures, and apply setpoints and database inputs to non-emergency procedures.

Volian recently completed a project to develop symptom-based emergency operating procedures for the MHI-designed US-APWR nuclear power plant.

Volian approaches a procedure upgrade program with the following objectives:

- To provide plant operators with procedures that are clear, complete and effective. This includes an evaluation of the operational strategy and recovery logic of both the procedure set as a whole and each procedure in the set to ensure that appropriate, direct and definitive guidance is provided.
- To address concerns identified with the current procedures. This may include feedback from the procedure user or evaluator, relevant industry experience and events, plant modifications requiring evaluation of related procedural guidance, and changes in the regulatory climate.
- To identify all supporting documentation that is impacted by the procedure upgrade. This may include setpoint documents, basis and deviation documents, and other documentation applicable to the upgraded procedure set.
- To improve the efficiency and technical control of the procedure maintenance process. Installation of the computerized procedure maintenance system VE-PROMS greatly increases the efficiency of procedure maintenance and enables rapid access to supporting documents for evaluation and revision purposes.

Volian's procedure development expertise is a product of our inherent knowledge of nuclear plant system interaction in response to postulated events requiring mitigative actions defined in plant procedures. Our procedure knowledge also extends to the technical basis documentation associated with various types of plant operating procedures. Volian can provide the documentation of procedure technical basis

information as part of the deliverables for a complete procedure upgrade project, or as a separate project in support of procedure upgrades by our customers. The project scope can include one or more of the following:

Procedure Technical Basis Document Development

Volian will research the individual plant design parameters to provide a complete and defensible justification for each procedure step, its subordinate steps, and all setpoints (generic or plant-specific) utilized in the mitigative actions defined by the step text. The format for presentation of this documentation is agreed upon with the customer prior to the onset of the development effort.

Procedure Step Deviation Document Development

Volian has extensive experience in documenting the plant-specific procedure step deviations from generic guideline requirements. Justifications for any deviation are clearly and concisely presented in the document to provide a complete and defensible justification for each deviation from the generic guidelines.

Volian can also provide the following additional support relating to the upgraded procedures:



Procedure Setpoint Development

Nuclear plant procedures provide the operators with technical guidance during a plant accident or abnormal operating environment to mitigate the consequences of an accident and to recover the plant to a safe shutdown condition. Within the procedures are certain values (setpoints) that direct the actions of the operators so that an accident can be properly diagnosed and mitigated. Many of the setpoints are derived from generically prescribed methodologies or values derived from analyses performed to determine the response of the plant during certain postulated accidents. To convert these generic values into plant specific setpoints requires much effort to ensure that the setpoints are technically correct and meet the intent of the generically prescribed guidance.

Volian is a recognized industry leader in determining the proper plant specific setpoint values for use in Tech Specs, EOPs and other operational procedures. This process requires a unique mix of understanding the technical basis of the procedures, knowledge of plant instrumentation and the inherent indication uncertainty, and understanding the transients involved. Volian personnel provide this unique mix. Volian engineers are recognized experts in LOCA and non-LOCA transient analyses and our forte is knowledge of the technical background of all types of procedures.

Volian has developed setpoint documentation to support other than Emergency Procedures, including Abnormal Operating Procedures, Dedicated Shutdown Procedures, Flex Support Guidelines, and Severe Accident Management Guidelines.

The procedure setpoint development process developed by Volian Enterprises responds to increasing NRC attention given to the documentation of procedure setpoints. The process is designed to conform to the individual plant's quality assurance standards, ultimately creating configured setpoint calculation documents (hardcopy and electronic versions) for inclusion in the plant's document maintenance program. Volian has produced setpoint documentation for the following nuclear power plants:

- Callaway
- D. C. Cook
- H. B. Robinson
- Indian Point Units 2 & 3
- Kewaunee
- North Anna
- Point Beach
- Prairie Island
- R. E. Ginna
- Surry
- Turkey Point
- Vogtle
- Wolf Creek

Some procedure setpoints include allowances for uncertainty in the indications used in the procedures to ensure that appropriate actions are taken before a condition is reached where critical process limits may be violated.

The calculation of instrument channel uncertainties is usually performed in conjunction with a setpoint development or upgrade project. However, our expertise in this area has also been enlisted for the sole purpose of generating instrument channel uncertainty analyses, sometimes adapting our expertise to utilize plant-specific software tools, including IISCS, a highly sophisticated relational database system employed at several plant locations.

Volian has developed an instrument uncertainty methodology based on ISA-RP67.04, or we could use a plant specific methodology based upon the customer's needs.

Severe Accident Management Guidelines

Production of high quality Severe Accident Management Guidelines (SAMGs) requires a concerted effort between the operations, engineering, training, and emergency planning departments. Volian has experience and expertise in all four functional areas. This background has proven to be invaluable for multi-disciplinary projects such as SAMG production. A summary of Volian's experience in these functional areas is provided below.

Emergency Planning

Since the majority of the SAMGs will be implemented from the TSC, the emergency planning department is instrumental in the development of the SAMGs. The TSC guidelines must be written in such a manner that the personnel manning the TSC will be able to effectively use them to evaluate plant conditions and recommend appropriate actions.

Volian has already developed guidelines to assist the TSC in responding to request for direction from the control room during the implementation of EOPs. Volian has also been involved with the upgrade of EALs to NUMARC standards at several nuclear plants.

Operations

The plant operations department is involved in the development of the SAMGs, and in the verification and validation of the procedures. Volian has been working with operations departments at many nuclear plants in the upgrade and maintenance of their operating procedures. With intimate knowledge of nuclear plant systems and their response to unintended scenarios, Volian will ensure that the SAMGs are written properly and appropriately integrated into the plant's procedure network.

Engineering

Engineering involvement is required during the development of SAMGs in two areas; the calculation of plant specific setpoints and the development of computational aids. Volian is a recognized leader in the development of setpoint documentation for many types of plant procedures. Volian has provided setpoint calculations for EOPs and AOPs for many nuclear plants. The progression of the SAMGs beyond the EOPs results in the need to develop additional setpoint calculations. The experience and expertise that Volian has developed with EOP setpoints increases our effectiveness in the development of SAMG setpoints.

The generic computational aids are concerned with containment related parameters or SI pump performance. Volian engineers have many years of experience in performing various types of containment analyses and maintain a working knowledge of the various hydrogen burn studies that have been performed throughout the industry.

Volian has developed an automated system for developing the computational aids using plant specific data inputs to a series of EXCEL spreadsheets. This product is offered as part of any plant specific SAMG development effort, or as an individual product for those plants wishing to increase the effectiveness of creating and maintaining computational aids.

Training

The training of the plant personnel involved in the implementation of the SAMGs is one of the most important aspects of a successful SAMG development project. Many of the actions required during the execution of the SAMGs are contrary to basic operator training. SAMG training enables the operator to recognize that plant conditions have degraded to the point where typical actions, instilled in the operator during EOP training, may no longer be appropriate. Volian personnel are familiar with lesson plan development, and are aware of operator concerns regarding the transfer of command and control to the TSC during the execution of the SAMGs.

Training Material Development

Training materials are needed to support presentations to plant personnel who may have not previously received formal training.

Volian's staff can provide assistance in the following areas:

- Operations and Technical Staff lesson plan development
- Emergency Operating Procedure lesson plans
- Simulator scenario development

Procedure Validation

An integral part of procedure development is the validation process. Several methods for validation have evolved which permit varying degrees of resource commitment and personnel support as appropriate for the particular procedure under evaluation.

Volian Enterprises' multi-disciplinary staff of human factors experts, technical experts, trainers and engineers can assist utilities in performing validations by:

- Assessing which validation method is appropriate for specific procedure modifications.
- Planning, scheduling, conducting and documenting individual validation programs.
- Developing validation programs to cover on-going procedure changes to assure that upgrade efforts are successful.



VOLIAN ENTERPRISES, INC.

PWROG ERG Rev. 3 and Addendum 2 for SAMGs

In 2013 the PWROG issued the Westinghouse Plant SAMG Second Addendum and in 2014 the PWROG issued Revision 3 of the ERGs. Volian engineers are knowledgeable on the changes made to both of these procedure sets, including changes to the recovery strategies used in the procedures. Volian can assist in both procedure and setpoint development for both EOPs and SAMGs.

Post-Fukushima Procedure Related Services

Volian Enterprises is available to provide support in the updating of procedures in support of plant's post-Fukushima action items including FLEX Support Guidelines (FSGs). The FSG's are an important upgrade necessary to comply with Post-Fukushima regulations passed by the NRC. With these procedures being new to the industry, it's very important to utilize experienced procedure writers with an engineering background. Volian Enterprises has been a leader in the PWR Accident Management area for 30 years. With that experience, we are uniquely qualified to assist utilities in implementing their FSGs. Volian Enterprises is committed to provide you with top quality procedures at a lower cost than our competitors can provide.

Procedure Program Evaluations, Assessments, and Audits

Volian procedure experts have extensive experience evaluating and developing programs to improve nuclear power plant procedures. Due to our support of many nuclear power plant procedure upgrade efforts, we are well suited to perform independent and safety assessments of procedure programs, including 50.59 evaluations. Volian could greatly assist in making improvements to the procedures at plants.

Technical Support on Engineering Analyses that Support EOPs

Volian has been involved on developing the technical basis of EOP actions for 30 years. Our personnel were involved in the initial efforts to improve Emergency Response Guidelines (ERGs) with Westinghouse after the TMI event in 1979. As a lead engineer and manager of the Nuclear Safety group supporting the ERG development, Mr. Julian has unique expertise and insight into the plant transient response to

Small Break LOCA, Steam Generator Tube Rupture, Inadequate Core Cooling, Loss of Heat Sink, Loss of All AC, and PTS. Volian has been a technical consultant supporting projects to develop an EOP and SAMG technical basis document for Russian designed nuclear power plants. Volian has served as a consultant to develop EOP guidelines and technical basis for a new nuclear reactor design to be implemented in the U.S.

For Additional Information:

Call:
(724) 335-3744

Fax:
(724) 337-9752

Email:
volianenterprises@volian.com

Website
www.volian.com

Harold V. Julian, President
HarryJulian@volian.com

Paul A. Linn, Vice President of Engineering
PLinn@volian.com



Volian Enterprises, Inc.
P.O. Box 410
Murrysville, PA 15668