



New Snubber Program Owner Training Seminar

Disclaimer

The information contained herein represents the experience and opinions of the presenters. It does not represent an official position or recommendation of the SNUber Users Group (SNUG) and is intended for informational use.

Information pertaining to ASME codes or regulatory positions is presented for historical purposes and any use or interpretations should be verified through those organizations utilizing their approved processes.

Speaker Introductions



Steve Norman

Steve Norman

- 12 Years with Fluor-Daniel at Farley
 - Piping Engineer in construction / Maintenance Engineer in production
- 19 Years with Southern Nuclear at Farley
 - Maintenance Specialist
- Snubber Program Owner at Farley for 21 years
- 2 ½ Years as Welding Engineer at Fort Calhoun
- 1 ½ Years as Pressure Test Coordinator at Palo Verde
- 3 ½ Years as IST Engineer at Vogtle 3&4
- Current Vice Chair of ASME Board on Nuclear, Clean Energy, Power, & Facilities Codes & Standards (BNCS)
- Current Chair of ASME BNCS Board on Operations
- Current Member of ASME BNCS Strategic Committee on Nuclear Facilities
- Current Member of ASME BNCS Task Group on Regulatory Endorsement
- Current Member of ASME BNCS Research Evaluation Group
- Current Chair of ASME Standards Committee on Qualification of Mechanical Equipment (QME)
- Current Member of ASME QME Subcommittee of Qualification of Dynamic Restraints (QDR)
- Current Vice-Chair of ASME OM Standards Committee (IST)
- Current Vice Chair of ASME OM Executive Committee
- Current Member of ASME OM Subcommittee on inquiries
- Current Chair of ASME OM Subcommittee ISTD
- Current Member of ASME BPV Code Section XI Standards Committee (ISI)
- Current Member of ASME Section XI Subgroup on Water Cooled Systems
- Current Chair of ASME BPV XI Working Group Pressure Testing
- Currently employed by Enercon Services, Inc., assigned to Farley

General Info



We will be going through material quickly



Questions are welcome, but in the interest of time, some may be deferred to conference Question & Answer times if time is not available during or after seminar

Purpose of Seminar

- Industry Personnel Turnover Results In
 - Lack of Program Continuity and Consistency
 - Loss of Knowledge and History
 - Loss of "Big Picture" as Focus Shifts to Implementing Established Tasks
- SNUG Board of Directors Approved Seminar(s) to Address These and Other Issues

History of SNUG

- First Meeting December 6, 1984
 - St. Petersburg, Florida
 - 26 Attendees
 - Generic Issue 113
- First Official Conference Summer of 1985 in Charlotte, NC
- Incorporated in 1998
- Annual Winter Working Conference from 1986 until 2020
- Annual Summer Conference & Trade Show from 1985 (held virtually in 2020 & 2021)
- Annual Business Meeting at Summer Conference since 1999

Past Issues

- Generic Issue 113 (NUREG/CR-5416)
- Generic Letter 90-09 Input
- Addressed Information Notices, Bulletins, etc.
 - IN 89-30
 - IN 94-48
- Input to LCO 3.0.8 development

SNUG Documents Available

- White Papers
- Working Group Reports
- Letters
- Other Documents

White Papers

- Alternate Visual Examinations
- End Attachment Gaps
- Vibration and Fretting Corrosion
- Drag Testing of Mechanical Snubbers
- Beyond Design Basis Events

Disclaimer with each White Paper:

THIS DOCUMENT HAS BEEN DEVELOPED BY THE SNUBBER USERS GROUP (SNUG) FOR USE BY ITS MEMBERSHIP. THIS INFORMATION IS REPRESENTATIVE OF THE GENERAL CONSENSUS OF THE SNUG, BUT MAY NOT REPRESENT THE OPINIONS OF ALL OF THE SNUG MEMBERSHIP. NO PART OF THIS DOCUMENT SHOULD BE CONSIDERED AS MANDATORY POLICY THAT MUST BE ADHERED TO BY ANY SNUG MEMBER.

Other Documents

- Lubrication Working Group Report
- Program Document Template
- Program Assessment Guide (workshop provided on use of guide)
- Letter to NRC Reply to IN 94-48

Manuals

- Seal Life Manual
- Hydraulic Snubber Manual
- Mechanical Snubber Manual

Seminar Objectives

- Focus on 'Big Picture'
 - Primarily Addresses Generic Program Scope and Basis Issues
 - Snubber Specific Technical Issues to be Addressed in More Specific Seminars
- Provide History of Program Requirements
 - Evolution of Requirements
 - Basis of Original Requirements
- Provide Overview of Current Program Requirements
 - Outline Current Requirements
 - Governing Documents / Licensing Basis for Current Requirements
 - Compare / Contrast Various Basis Requirements
 - Interaction of Codes & Regulations
- Provide Overview of Future Program Requirements
 - Outline Future Requirements
 - Changes in Code Requirements for Future Advanced Reactor Design Facilities

History of Snubber Program Requirements

- Plants built in the 1960's and early 1970's had no testing, examination or service life monitoring requirements for snubbers.
- Snubber supports were treated the same as variable spring supports or constant load supports.
- Snubber supports were included in the ISI program along with all other types of supports.
- Most snubber populations were primarily hydraulic at that time and most hydraulics had external tubing and gravity feed reservoirs.
- Snubbers began exhibiting problems associated with hydraulic fluid leaks, mostly occurring at tubing fittings or with lexan reservoirs cracking.

History of Snubber Program Requirements

- First NRC requirements issued early to mid 1970's
 - Developed because of experiences with snubbers in service
 - Hydraulic snubber seals
 - Failure to lock-up
 - IEB 73-03: Defective Hydraulic Shock Suppressors and Restraints
 - IEB 73-04: Defective Bergen-Paterson Hydraulic Shock Absorbers
 - IEB 75-05: Operability of Category I Hydraulic Shock and Sway Suppressors
 - IEB 78-10: Bergen-Paterson Hydraulic Shock Suppressor Accumulator Spring Coils

History of Snubber Program Requirements (Cont.)

- Early Technical Specifications
 - NUREG-371 Recommendations
 - Development of Technical Specification
 - Standard Review Plan (SRP) Revision
 - Regulatory Guides
 - 1980 - Revision to Standard Tech Specs 3/4.7.9 (Snubbers)
 - 1981 – Revision to SRP 3.9.3

History of Snubber Examination & Testing Requirements (Cont.)

- Early Technical Specifications
 - Initial Tech Specs applied only to hydraulics
 - Included visual examination and functional test requirements (no service life monitoring requirements)
 - 100% visuals at least once every 18 months
 - » As often as every month depending upon number of failures
 - » Every month if seal material is not proven
 - Testing applied to 50 Kip and smaller
 - » Lock-up, bleed, and FOM (In-service Drag) tests required
 - » 10 snubbers or 10% (smaller of two) each outage
 - » Supplemental samples of equal size tested for each failure

Typical Snubber Tech Spec Visual Table from 1980's

SURVEILLANCE REQUIREMENTS

4.7.9 Each snubber shall be demonstrated OPERABLE by performance of the following augmented inservice inspection program and the requirements of Specification 4.0.5.

a. Visual Inspections

The first inservice visual inspection of snubbers shall be performed after four months but within 10 months of POWER OPERATION and shall include all snubbers within the scope of Specification 3.7.9. If less than two (2) snubbers are found inoperable during the first inservice visual inspection, the second inservice visual inspection shall be performed 12 months $\pm$ 25% from the date of the first inspection. Otherwise, subsequent visual inspections shall be performed in accordance with the following schedule:

<u>No. Inoperable Snubbers per Inspection Period</u>	<u>Subsequent Visual Inspection Period*#</u>
0	18 months $\pm$ 25%
1	12 months $\pm$ 25%
2	6 months $\pm$ 25%
3,4	124 days $\pm$ 25%
5, 6, 7	62 days $\pm$ 25%
8 or more	31 days $\pm$ 25%

The snubbers may be categorized into two groups: Those accessible and those inaccessible during reactor operation. Each group may be inspected independently in accordance with the above schedule.

History of Snubber Program Requirements (cont.)

- NRC Revised Requirements
 - 1980, 1984 Generic Letters addressed revised Tech Spec requirements
 - Primarily formed basis for most "Original" Tech Specs (Pre-ITS)
 - All sizes included
 - Categorization of snubbers by design
 - In-service drag test requirements for hydraulic snubbers removed
 - Various sample plans offered
 - Generic Letter 80-99 revised TS and added requirements for mechanical snubbers
 - Activation and drag tests required
 - Freedom of Motion Tests
 - 1981 – IE 81-01 addressed “frozen” INS mechanical snubbers
 - Generic Letter 84-13 eliminated snubber list from Tech Specs

Typical Tech Spec Snubber List

TABLE 3.7-4a

SAFETY RELATED HYDRAULIC SNUBBERS*

<u>SNUBBER NO.</u>	<u>SYSTEM SNUBBER INSTALLED ON, LOCATION AND ELEVATION</u>	<u>ACCESSIBLE OR INACCESSIBLE (A or I)</u>	<u>HIGH RADIATION ZONE DURING SHUTDOWN** (Yes or No)</u>	<u>ESPECIALLY DIFFICULT TO REMOVE (Yes or No)</u>
2MS-R534	Aux. Bldg., E1. 179'-7-3/16" Col. Lines T15 & T16 TA & TA	A	No	Yes
2MS-R532#	Aux. Bldg., E1. 155'-7-3/8" Col. Lines TA & A 31 & 34	A	No	Yes
2MS-R533	Aux. Bldg., E1. 155'-7-3/8" Col. Lines TA & A 31 & 34	A	No	Yes
2MS-R517	Aux. Bldg., E1. 130'-2" Col. Lines C & D 34 & 36	A	No	Yes
2MS-R516#	Aux. Bldg., E1. 130'-2" Col. Lines C & D 34 & 36	A	No	Yes
2MS-R503#	Aux. Bldg., E1. 130'-2" Col. Lines C & D 31 & 34	A	No	Yes
2MS-R505	Aux. Bldg., E1. 130'-2" Col. Lines C & D 31 & 34	A	No	Yes
2MS-R510	Aux. Bldg., E1. 130'-2" Col. Lines C & D 31 & 34	A	No	Yes
2MS-R522	Aux. Bldg., E1. 147'-0-11/16" Col. Lines A & B 31 & 34	A	No	Yes

Snubber List Commitment

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 55 TO FACILITY OPERATING LICENSE NO. NPF-2

AND AMENDMENT NO. 46 TO FACILITY OPERATING LICENSE NO. NPF-8

ALABAMA POWER COMPANY

JOSEPH M. FARLEY NUCLEAR PLANT, UNIT NOS. 1 AND 2

DOCKET NOS. 50-348 AND 50-364

Introduction

Alabama Power Company (APCo) by letter dated July 6, 1984, requested amendments to the Farley Units 1 and 2 Technical Specifications (TSs). The proposed amendments consist of revisions to the snubber Technical Specifications (Section 3/4.7.9) pursuant to NRC Generic Letter 84-13 and miscellaneous administrative changes to other sections of the Technical Specifications. Our evaluation follows.

Evaluation

The licensee proposed to delete Tables 3.7-4a and 3.7-4b from the Units 1 and 2 Technical Specifications. Deletion of these tables, which list safety-related snubbers, will eliminate the need for frequent TS amendments to incorporate changes in the snubber listings. This change is in accordance with guidance issued to all licensees in NRC Generic Letter 84-13, dated May 3, 1984, Subject: Technical Specification for Snubber (Generic Letter 84-13). The licensee will maintain the listing of safety-related snubbers in the plant surveillance procedures. Changes to these lists are subject to the provisions of 10 CFR 50.59.

History of Snubber Program Requirements (cont.)

- Section XI
 - 1978 ASME Section XI Article IWF-5000 introduced (Winter addenda)
 - Small bore only (< 50 kips)
 - 10% testing only, representative
 - Rotate through population
 - 1982 NRC Rulemaking endorsed Section XI for first time
 - 1987 Addenda
 - added reference to OM Part 4 (in preparation)
 - Added examinations (referenced VT-3, IWA-2213)
 - Added attachments
 - Dropped size limit
 - Removed test and sample details
 - 1989 Incorporated dates (OM-1987 published in 1988)
 - 1992 Removed OM publication dates
 - 2006 Addenda deleted snubbers from Section XI

Section XI Article IWF

SUBSECTION IWF REQUIREMENTS FOR CLASS 1, 2, 3, AND MC COMPONENT SUPPORTS OF LIGHT-WATER-COOLED PLANTS

ARTICLE IWF-1000 SCOPE AND RESPONSIBILITY

IWF-1100 SCOPE

This Subsection provides the requirements for inservice inspection of Class 1, 2, 3, and MC component supports.

IWF-1200 COMPONENT SUPPORTS SUBJECT TO EXAMINATION AND TEST

IWF-1210 EXAMINATION REQUIREMENTS

The examination requirements shall apply to the following:

- (a) piping supports
- (b) supports other than piping supports

IWF-1220 SNUBBER INSPECTION REQUIREMENTS⁴⁰

The inservice inspection requirements for snubbers are outside the scope of this Division.

IWF-1230 SUPPORTS EXEMPT FROM EXAMINATION

Supports exempt from the examination requirements of [Article IWF-2000](#) are those connected to piping and other items exempted from volumetric, surface, or VT-1 or VT-3 or general visual examination by [IWB-1220\(a\)](#) through [IWB-1220\(c\)](#); [IWC-1221](#), [IWC-1222](#); [IWD-1220\(a\)](#) through [IWD-1220\(d\)](#); and [IWE-1220\(a\)](#), [IWE-1220\(c\)](#), and [IWE-1220\(d\)](#). In addition, portions of supports that are inaccessible by being encased in

concrete, buried underground, or encapsulated by guard pipe are also exempt from the examination requirements of [Article IWF-2000](#).

IWF-1300 SUPPORT EXAMINATION BOUNDARIES

The support examination boundaries for both integral and nonintegral supports are shown in [Figure IWF-1300-1](#). The following definitions apply.

(a) The boundary of an integral support (B) connected to a pressure-retaining component (A) is the distance from the pressure-retaining component (A) as indicated in [Subsection IWB](#), [Subsection IWC](#), [Subsection IWD](#), and [Subsection IWE](#).

(b) The boundary of an integral support (C) connected to a building structure (E) is the surface of the building structure.

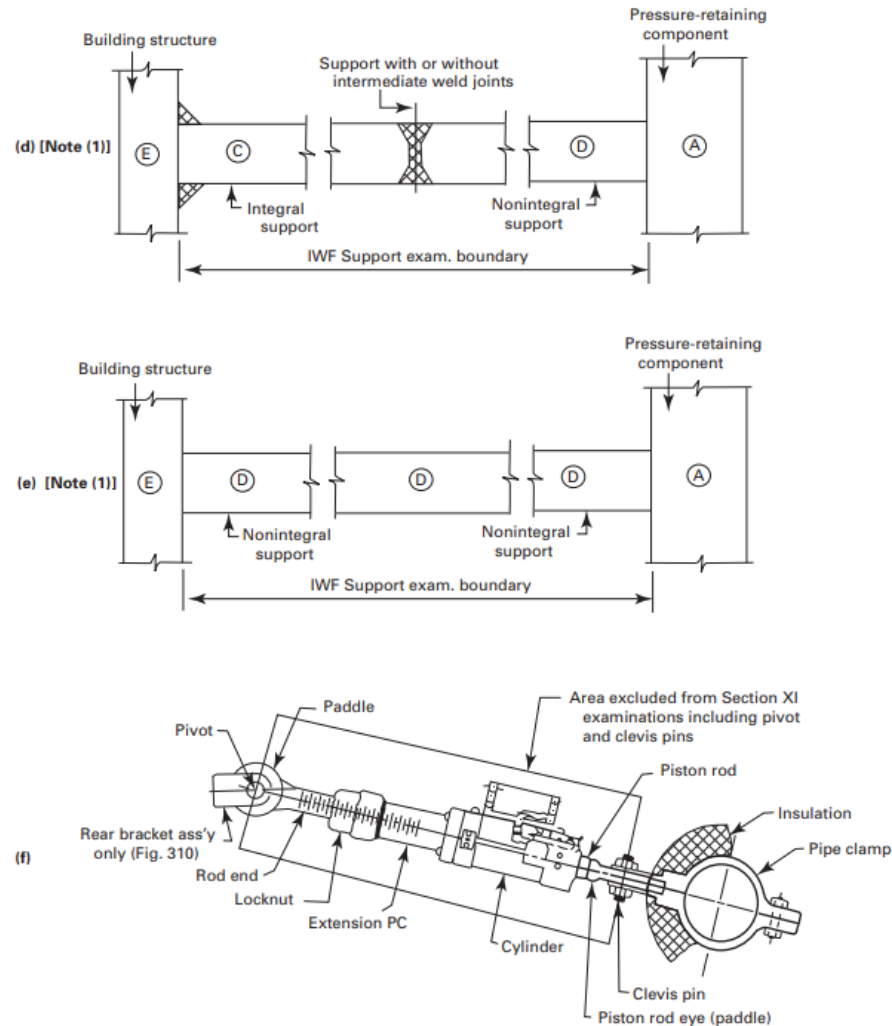
(c) The boundary of a nonintegral support (D) connected to a pressure-retaining component (A) is the contact surface between the component and the support.

(d) The boundary of a nonintegral support (D) connected to a building structure (E) is the surface of the building structure.

(e) Where the mechanical connection of a nonintegral support is buried within the component insulation, the support boundary may extend from the surface of the component insulation, provided the support is under continuous tension or compression load.

Section XI Figure IWF-1300-1

Figure IWF-1300-1
Illustrations of Typical Support Examination Boundaries (Cont'd)



History of Snubber Program Requirements (cont.)

- ASME OM-4 / ISTD / DRD
 - Working Group formed in late 1970's
 - Tasked to develop pre-service and in-service snubber examination requirements (OM Part 4)
 - OM Part 4 issued as Oma-1988 addenda to 1987 OM Code
 - Eventually became Subsection ISTD of OM-1990
 - Two Test Plans
 - 10% Plan
 - 37 Plan
 - ISTD will become DRD when new OM-1 Code is published
 - OM-2 Code has already been published and contains requirements for snubber programs at advanced reactor design facilities in Section DRD

History of Snubber Program Requirements (cont.)

- Improved Technical Specifications
 - Improved Tech Specs (ITS) mid - late 90's
 - Relocated snubbers to Owner Controlled Documents (TRMs)
 - Requirements unchanged (cut & paste from Tech Spec to Owner Controlled Document)
 - Changes per 10CFR50.59 possible
 - LCO for snubbers was lost for most sites
 - LCO 3.0.8 was added to recover snubber LCO

History of Snubber Program Requirements (cont.)

Comparison of Early Tech Specs / Later Tech Specs / Section XI / OM Code / OM-1 Code / OM-2 Code

The tables on the following slides will provide a comparison of the following topics over several program guidance documents:

- Scope
- Examination Boundary
- Personnel Certifications
- Test Plans
- Failure Mode Grouping
- Drag Testing
- Service Life Monitoring

Scope Comparisons

Early Tech Specs (1980)	Later Tech Specs (TRMs) (1994)	ASME Section XI IWF (1978-1987a)	ASME Section XI IWF (1987a-2006)	OM Code OM-4 (1988)	OM Code ISTD (ISTA) (1990–2022)	OM-1 Code DRD (GR) 2027	OM-2 Code DRD (GR) 2024
All Safety Related Hydraulic Snubbers	All Safety Related Snubbers + Snubbers Affecting SR Systems	Class 1, 2, 3, & MC Snubbers with Load ratings < 50 kips <u>Testing Only</u>	Class 1, 2, 3, & MC Snubbers <u>Added Examinations</u>	All Safety Related Snubbers	RC Pressure Boundary, Achieve or Maintain Safe Shutdown, Mitigate Accident	Achieve or Maintain Safe Shutdown, Mitigate Accident	As Specified

Boundary Comparisons

Early Tech Specs (1980)	Later Tech Specs (TRMs) (1994)	ASME Section XI IWF (1978-1987a)	ASME Section XI IWF (1987a-2006)	ASME Section XI IWF (2006)	OM Code OM-4 (1988)	OM Code ISTD (1990-2022)	OM-1 Code DRD (2027)	OM-2 Code DRD (2024)
Pipe to Building Structure	Pipe to Building Structure	Pipe to Building Structure	Refers to OM-4	Excludes snubber Pin to Pin	Pipe to Building Structure	Pin to Pin	Pin-to-Pin	Pin-to-Pin

Certification Comparisons

Early Tech Specs (1980)	Later Tech Specs (TRMs) (1994)	ASME Section XI IWF (1987a)	OM Code OM-4 (1988)	OM Code ISTD (1990-2022)	OM-1 Code DRD (2027)	OM-2 Code DRD (2024)
None	None	VT-3 Method required	Per Owner's Reqs.	Per Owner's Reqs	Per Owner's Reqs	Per Owner's Reqs

Test Plan Comparisons

Early Tech Specs (1980)	Later Tech Specs (TRMs) (1994)	ASME Section XI IWF (1978a)	ASME Section XI IWF (1987)	OM Code OM-4 (1988)	OM Code ISTD (1990-2022)	OM-1 Code DRD (2027)	OM-2 Code DRD (2024)
10% or 10 No FMG	10%, 37 (others, 88,55,etc) No FMG	10% No FMG	Refers to OM-4 (pointer removed in 2006 Addenda)	10%, 37 Mandatory FMG	10%, 37 Optional FMG	10%, 37 Optional FMG	All snubbers every 10 yrs No FMG

Drag Test Comparisons

Early Tech Specs (1980)	Later Tech Specs (TRMs) (1994)	ASME Section XI (1978a)	ASME Section XI (1987)	OM Code OM-4 (1988)	OM Code ISTD (1990-2022)	OM-1 Code DRD (2027)	OM-2 Code DRD (2024)
Hydraulic Breakaway & Running	Mechanical Breakaway & Running	Hydraulic & Mechanical Breakaway & Running	Refers to OM-4 (pointer removed in 2006 Addenda)	Mechanical Breakaway & Running	Mechanical Running	Mechanical	Mechanical

Service Life Comparisons

Early Tech Specs (1980)	Later Tech Specs (TRMs) (1994)	ASME Section XI (< 1987)	ASME Section XI (1987)	OM Code OM-4 (1988)	OM Code ISTD (1990-2022)	OM-1 Code DRD (2027)	OM-2 Code DRD (2024)
None	Yes	None	Refers to OM-4 (pointer removed in 2006 Addenda)	None	Yes	Yes	Yes

Current Requirements

- General Program Requirements Today
 - Visual Examination
 - Functional Testing
 - Service Life Monitoring
 - Documentation
 - Maintain Listing of Snubbers
 - Maintain Service Life Data
 - Design/Licensing Basis of Program (site specific)
 - Implementation (actions taken)
 - NUREG 1482 Appendix A Addresses Program Requirements

Current Requirements

- Applicable Site-Specific Licensing Basis for Requirements
 - Technical Specifications (in some cases LCOs only)
 - Owner Controlled Documents (TRMs)
 - Section XI (Prior to 2006 addenda)
 - OM-4 (none currently)
 - ISTD
 - OM-2 for Advanced Reactor Designs)
 - OM-1 Section DRD for Legacy Designs (expected issue 2027)
 - Relief Requests
- Reconciliation of Multiple Basis Documents
 - Must define ALL governing requirements for the Program
 - If Tech Specs/TRM do not match the governing Code then both sets of requirements must be satisfied
 - If applicable, Section XI requirements must be met unless relief is granted

Current Requirements (cont.)

— Recent & Future Changes

- Section XI Article IWF-5000 Deleted in 2006 Addenda
- Subsequent to 2006a all Snubber In-Service Requirements to be in accordance with OM ISTD
- **NRC rulemaking requires ISTD if using SC XI 2006 addenda or later**
- Any exception requires an approved Relief Request
- Must update TS/TRM/Commitments/Procedures to incorporate or reference OM ISTA and ISTD.
- OM-2 Code has been published for advanced reactor designs and snubber are included in Section DRD (Dynamic Restraint Devices) of that code. OM-2 will not be included in Rulemaking, but instead will be endorsed by a Reg Guide.
- Existing OM Code is being reformatted and rebranded as OM-1 and snubbers will be included in Section DRD of that code. OM-1 is intended to be used by legacy plants and will be mandated by 10CFR50.55a. The OM-1 Code is expected to be published in 2027.

Historic Reference Documents

- There are many historical documents that drove the evolution of snubber examination, testing, and service life requirements to current practices.
- NRC, manufacturers, INPO, EPRI, etc.
- Some provide good background information; others simply show the early industry lack of understanding.
- Many are readily available, others not so much.
- The list provided is not all inclusive but meant to convey the long history and depth of input that got us where we are today – both the good and the bad.

NRC Generic Letters & Bulletins

Generic Letters

- GL 80-99, Surveillance Requirements for Mechanical Snubbers
- GL-84-13, Technical Specification For Snubbers
- GL-89-09, ASME Section III Component Replacements
- GL 90-09, Visual Inspection Frequency
- GL 91-18, Operability Guidelines

Bulletins

- B73-03, Defective Hydraulic Shock Suppressors
- B73-04, Defective Bergen Paterson Hydraulic Shock Suppressors
- B75-05, Operability of Hydraulic Shock Suppressors
- B78-10, Bergen-Paterson Hydraulic Shock Suppressor Accumulator Spring Coils
- B79-02, Pipe Support Anchor Bolts
- B79-14, Configuration Verification
- B81-01, Failures/Surveillance of Mechanical Snubbers

NRC Information Notices

N79-01, Bergen-Paterson Hydraulic Shock Arrestors
N79-05, Improper Materials in Safety Related Components
N80-42, Radiation Effects on Hydraulic Snubber Fluid
N82-12, Failure/Surveillance of Hydraulic Snubbers
N83-13, Misapplication of Bergen-Paterson Clamp
N83-20, ITT-G Fig. 306/307 Mechanical Snubber Attachment Interference
N83-47, Failure of Hydraulic Snubbers
N84-67, Recent Snubber Testing High Failure Rate
N84-73, Down Rating of Self Aligning Ball Bushings
N86-102, Repeated Multiple Failures of SG Snubbers
N88-95, Inadequate Validation of Procured Parts for Anchor/Darling
Mechanical Snubbers

NRC Information Notices

N89-30, High Temperature Environment

N94-48, High Temperature Environment

N95-09, Use of Inappropriate Guidelines/Criteria for Operability
Evaluations of Pipe and Supports

N97-16, Pre-conditioning of Components Prior to IST

N97-71, Inappropriate Use of 50.59 Regarding Reduced Seismic
Criteria for Temporary Conditions

NRC RIS & EGM

RIS 2010-06, Inservice Inspection and Testing Requirements of
Dynamic Restraints (Snubbers)

EGM 10-001, Enforcement Guidance Memorandum, Dispositioning
Violations for Inservice Examination and Testing
Requirements for Dynamic Restraints (Snubbers)

NRC Circulars

C76-05, Bleed and Lock-up Velocities on ITT-Grinnell Figure 200 and
201 Hydraulic Shock Suppressors

C78-07, Damaged Components of Bergen-Paterson Series 25000 Test
Stand

C79-25, Bergen-Paterson Shock Arrestor Strut Assembly Interference

C81-05, Self-Aligning Rod End Bushings for Pipe Supports

NRC NUREGs

NUREG-371

NUREG-933

NUREG-1482

CR-2175, Snubber Sensitivity Study

CR-2032, Single Vs. Dual Snubber Installations

CR-2136, Effects of Postulated Event Devices on Normal Operation of
Piping Systems in Nuclear Power Plants

CR-4279, Aging and Service Wear of Hydraulic and Mechanical
Snubbers Used on Safety-Related Piping and Components of
Nuclear Power Plants

CR-5386, Basis for Snubber Aging Research

CR-5416, Generic Issue 113, Dynamic Qualification and Testing of
Large Bore Hydraulic Snubbers

CR-5646, Piping System Response During High Level Simulated
Seismic test at the Heissdampfreaktor Facility (SHAM Test
Facility)

CR-5870, Results of LWR Snubber Aging Research

CR-6027, Evaluation of Snubber Single Failures

EPRI Documents

NP-2297	Snubber Reliability Improvement Study
NP-5854	Assessing the Costs, Risks, and Benefits of Snubber Reduction: A Comprehensive Framework (June 1988).
NP-6443	Improved Criteria for Snubber Functional Testing, July 1989.
NSAC-104	Guidelines for Reducing Snubbers on Nuclear Piping Systems
TR-1010968	Tier 2, Volume 1, Guidelines and Criteria for Nuclear Piping and Support Evaluation and Design, Integration of Methods and Guidelines to Evaluate Nuclear Piping and Pipe Support Design and Operability Issues. (Not NRC endorsed)
TR-1010968	Tier 2, Volume 4, Guidelines and Criteria for Nuclear Piping and Support Evaluation and Design, Behavior and Failure Mode of Standard Pipe Supports Beyond Their Design Conditions
TR-102363	Tier 1 & 2, Evaluation of Snubber Functional Test Methods.
TR-6270-1	Snubber Reduction Program (October 1985)

INPO Documents

86-014, Good Practice MA-313, “Snubber Maintenance Program”
(never formally approved)

OMRs (Operations and Maintenance Reminders)

- OMR-19, Grinnell Snubber Orientation
- OMR-20, Corroded INS Mechanical Snubbers
- OMR-38, Grinnell Snubber Orientation
- OMR-83, ITT Grinnell Hydraulic Snubbers
- OMR-115, Steam Generator Snubber Failures
- OMR-146, Failure of PSA Mechanical Snubbers
- OMR-223, Waterhammer in RHR System Damages Snubber
- OMR-310, Aux. Feedwater Pump Trip

SERs (Significant Event Reports)

- SER22-81, Corrosion Failure of Mechanical Snubbers
- SER54-81, ECCS Piping Damaged
- SER90-81, High Occurrence of Degraded Hydraulic Snubbers

Technical Reports

Combustion Engineering Report 82-02,
Installation of Grinnell Hydraulic Snubbers

General Electric Report SIL021,
Seals for Bergen-Paterson Hydraulic Shock Suppressors

General Electric Report SIL021S1,
Seals for Bergen-Paterson Hydraulic Shock Suppressors

General Electric Report SIL021S2,
Seals for Bergen-Paterson Hydraulic Shock Suppressors

General Electric Report SIL021S3,
Seals for Bergen-Paterson Hydraulic Shock Suppressors

General Electric Report SIL021S4,
Snubber Surveillance Program

General Electric Report SIL021S5,
Seals for Grinnell Hydraulic Shock Suppressors

General Electric Report SIL070,
Hydraulic Shock Suppressor Application

General Electric Report SIL339,
Mechanically Locked Snubbers



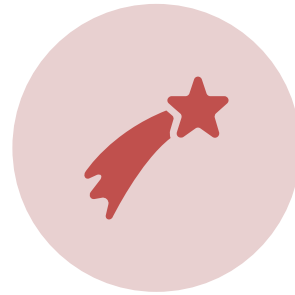
QUESTIONS?



COMMENTS?



THANK YOU FOR YOUR
TIME.



WE HOPE YOU HAVE
LEARNED SOMETHING
TODAY.

MORNING BEVERAGE BREAK
SPONSORED BY



RETURN BY 10:00 AM



S N U B B E R U S E R S G R O U P

**Late Registration is Open
Session will start at 10:00 AM**

PLEDGE OF ALLEGIANCE

Before we call the conference to order, please join us in the Pledge of Allegiance to the American Flag.





S N U B B E R U S E R S G R O U P

SNUBBER USERS GROUP 2026 SUMMER CONFERENCE & TRADE SHOW

**Call To Order
Scott Esposito**

WELCOME!!



- **Administrative Items & Announcements**
 - Safety
 - Survey Forms
 - Ballots for Director Election
 - Question Cards/Benchmarking Cards
 - SNUG Inc. Business Meeting
 - Board Meeting after today's session to elect officers for 2026-2027



MORNING AGENDA

Agenda

- Welcome and Special Events:
 - Xcel Energy
 - Element Nuclear
- Introductions
- Vendor Products and Services



ON BEHALF OF XCEL ENERGY AND ELEMENT
NUCLEAR, WELCOME TO THE SUMMER 2026
SNUBBER USERS GROUP CONFERENCE &
TRADE SHOW



NUCLEAR ENERGY AT XCEL ENERGY

OVERVIEW





ABOUT XCEL ENERGY

Xcel Energy is a major U.S. electricity and natural gas company based in Minneapolis, Minnesota. Through four regulated operating companies across eight Western and Midwestern states, we offer our millions of customers safe, reliable, increasingly clean energy at the lowest cost possible. In 2018, we became the first major U.S. power company with a vision for providing 100% carbon-free electricity. Since then, we've expanded our leadership by becoming the first in our industry to outline a comprehensive pathway to net-zero emissions across electricity, natural gas use in buildings and transportation. We continue to make steady progress while prioritizing affordability and reliability.

AWARDS

- Ethisphere World's Most Ethical Companies®
- Fortune World's Most Admired Companies
- Military Times Best for Vets

VISION

We will be the trusted and preferred provider of energy our customers need.

MISSION

To make energy work better for our customers, helping them thrive every day.

VALUES



Connected



Committed



Trustworthy



Safe

OUR PRIORITIES

Our customers Our people Our performance



58%

carbon emissions
reduction from
2005 levels

53%

carbon-free
energy mix

115k

miles of electric
transmission lines

225k

miles of electric
distribution lines

32%

below national
average electric bills

3.9M

electric
customers

2.2M

natural gas
customers

\$5.8B

spent with
local businesses

\$181M

energy assistance to
200,000 households

\$13.5M

philanthropic
contributions



XCEL ENERGY

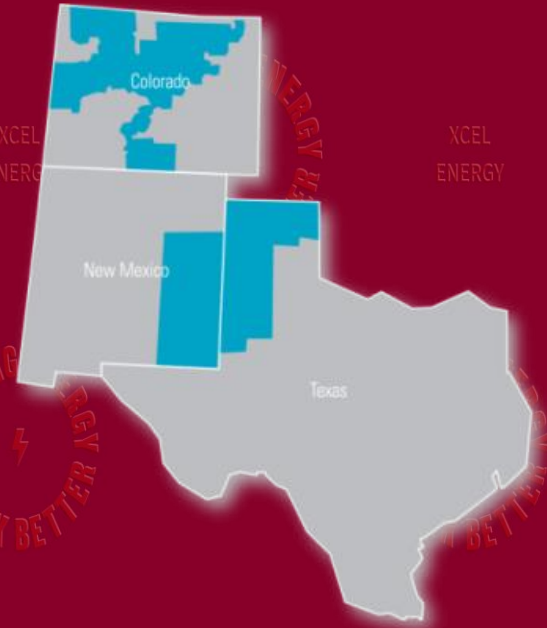
OVERVIEW

SERVING 8 STATES

3.1 MILLION ELECTRIC CUSTOMERS
2.1 MILLION NATURAL GAS CUSTOMERS
11,380 EMPLOYEES

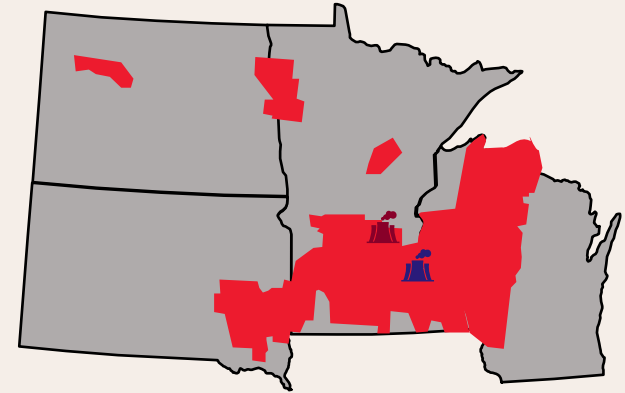
Nationally recognized leader:

- Carbon emissions reductions
- Wind energy
- Energy efficiency
- Innovative technology
- Storm restoration



About Xcel Energy Nuclear

Nuclear power is a clean, reliable, secure energy resource we can count on for our energy future. Central to that future are the two nuclear facilities we own and operate in Minnesota: the Monticello Nuclear Generating Plant in Monticello and the Prairie Island Nuclear Generating Plant near Red Wing. Together, these plants supply over 23% of the state's electricity, with no carbon emissions, making them a key piece of Minnesota's goal of being carbon free by 2040.



CLEAN
8.3 million

Metric tons of carbon emissions avoided by nuclear energy in Minnesota



ECONOMIC
\$1 billion

Annual contribution by nuclear in local economy



RELIABLE
1.3 million

Number of homes powered by nuclear energy in Minnesota 24/7



SAFE

Our nuclear plants have excellent safety records. We have several layers of safety systems in place to protect the public, our employees and the plants.



Monticello

One boiling water reactor (1970)
Licensed through 2050
671 MW
Jobs: 470

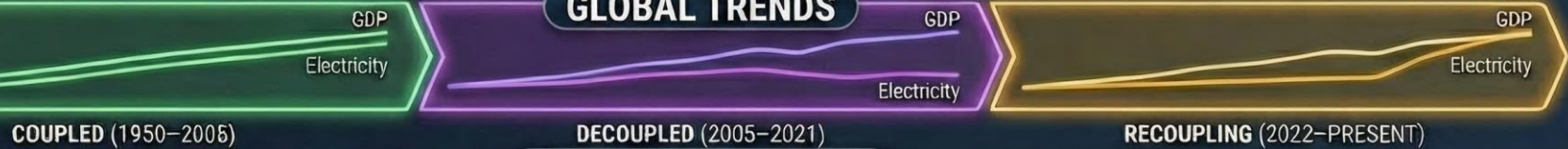


Prairie Island

Two pressurized water reactors (1973/1974)
Licensed through 2033/2034 (SLR)
1,100 MW
Jobs: 560

THE GREAT RECOUPLING: THE 15-YEAR HOLIDAY FROM DEMAND GROWTH IS OVER

GLOBAL TRENDS



REGIONAL ANALYSIS



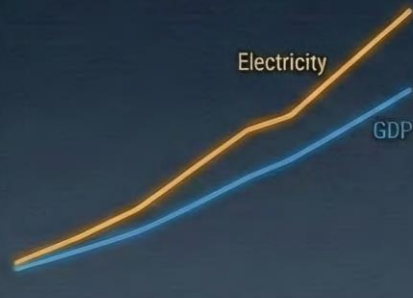
US: THE VISCERAL GAP CLOSES



Driven by Data Centers, EVs



CHINA: HYPER-COUPLING



Electricity growing faster than GDP



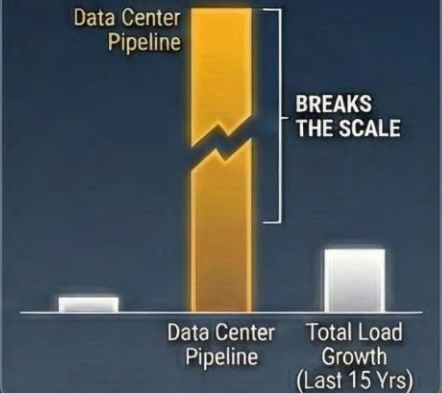
EU: STAGNANT DEMAND



Warning: Stagnation, not just efficiency



CANADA: BREAKING THE SCALE



NUCLEAR INDUSTRY GROWTH

DOE Reactor Pilot OKLO Aurora at INL

NRC Construction Permit Applications

- Kemmerer Power Station 1 (Terra Power Natrium) Molten Salt Fast Reactor, Wyoming
- Clinch River SMR (TVA GE BWRX-300) Light Water BWR, Tennessee
- Long Mott Generating Station (X-Energy/Dow Chemical) High Temperature Gas Reactor, Texas

Corporate Purchase Power Agreements

- Amazon and Susquehanna, Pennsylvania
- Microsoft and Constellation Crane Energy Center, Pennsylvania
- Google and Kairos Power, Hermes Reactor (75 Mwe), Fluoride, Salt-Cooled, High Temperature, Tennessee

Other Agreements

- Meta with multiple partners, Constellation, Vistra (Upgrade existing plants), Terra Power, OKLO
- Amazon, Energy Northwest and X-Energy



NUCLEAR INDUSTRY GROWTH

- Province of Ontario approved OPG Darlington construction May 2025
- Orlen-Synthos in Poland (24 total BWRX-300) – Project Phoenix (Coal to SMR)
- US government \$80B to construct 10 Large AP reactors (1000 and/or 300s) beginning in 2030 (VC Summer Construction)
- Fermi America Texas Panhandle up to 4 AP1000s to power data centers
- Holtec SMR-300, Received DOE “Tier 1 First Mover Award” \$400M, Owner and Operator: Palisades, Construction permit application submitted Jan 2026



TAKE AWAYS

The future **won't** be written by:

- Researchers, regulators or vendors

It will be written by:

- **The people who build and operate**
- What will you choose to do?



QUESTIONS?



INTRODUCTIONS

- Name
- Utility/Vendor
- Years with snubbers
- What do you want out of this conference?



Participating Vendors



ASC Engineered Solutions

Overview – SNUG 2026



Building connections that last™



The connection makes us stronger

Every day, the professionals who build and maintain our world depend on ASC Engineered Solutions. Our precision-engineered pipe connections, valves, support solutions and related services are used in everything from commercial buildings and industrial facilities to power plants and oil fields.

- Industry leading product portfolio with 40,000+ SKU's
- Over 1 million square feet of distribution space servicing customers coast to coast within 48 hours
- More than 2,000 employees worldwide





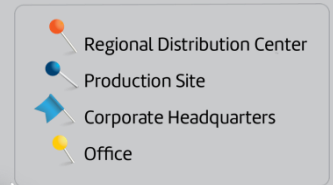
11 North American **distribution center locations** ensure timely and accurate shipments



25 Domestic **operational sites** within North America



Many strategic globally sourced **partnerships**



Dedicated Support Personnel

- Top tier agent and direct sales support
- Team of contractor & engineer specialists focused on technical and end user support
- Field service and on-site training
- Best-in-class resources for design, training, and product selection

Working together for your success

ASC Engineered Solutions has extensive experience and expertise in key markets:

- **Plumbing & mechanical**, where value, ease of configuration and installation can make the difference between a profitable project and one that incurs a loss
- **Commercial & residential construction**, where project efficiency and productivity are essential to get the job done on time and on budget
- **Industrial**, where product demands are extreme, specifications are rigorous and high precision is required
- **Fire protection**, where dependability and safety are essential to protect people's lives
- **Oil & gas**, where high-demand environments require reliable supply, flexible delivery and rapid response
- **Energy & power**, where highly specialized products, technical knowledge and services are mission-critical



Industry Engagement

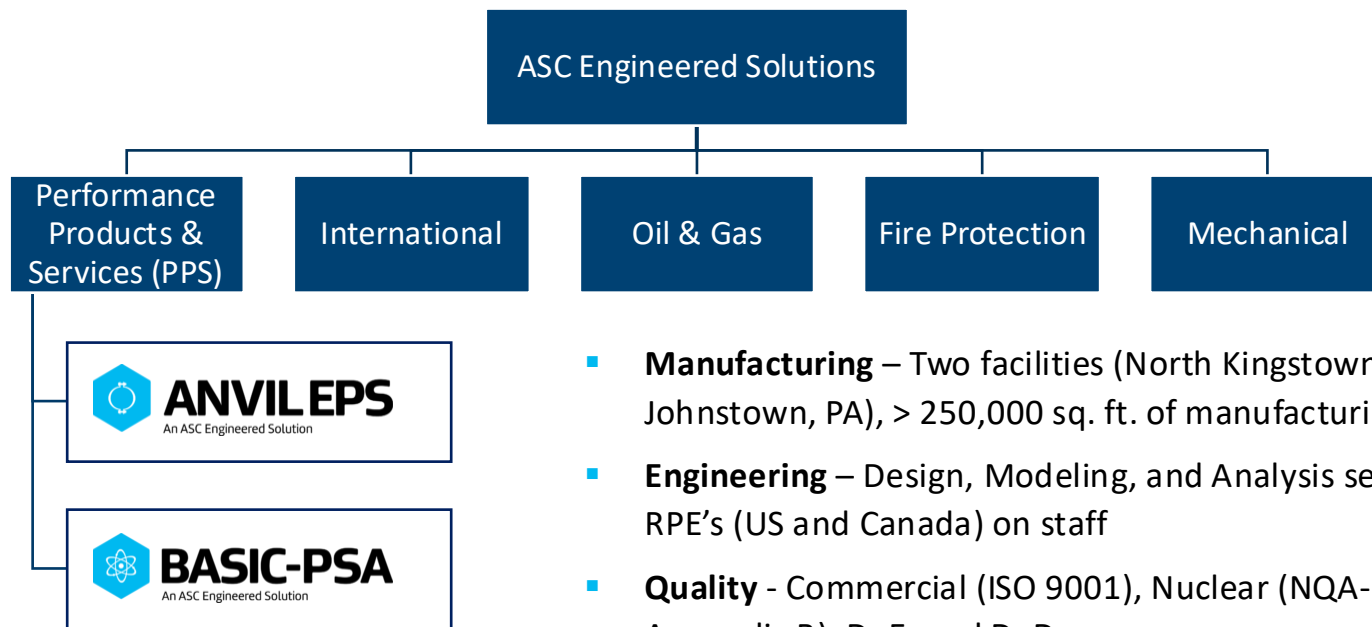
- ASC Focuses on Thought Leadership in our Dynamic Industries
- Proud Participation in Association and Leading Organization Events, Forums, and User Groups
 - ACIBC, SIBC, SNA Symposium, Air & Space, SNUG, ISTOG, etc.
- Sharing of Best Practices to Increase our Customer Productivity and Profitability
- Product, Tool, and Software Training



Products



Company Structure

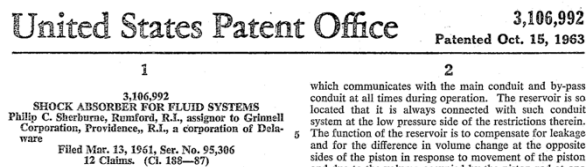


- **Manufacturing** – Two facilities (North Kingstown, RI & Johnstown, PA), > 250,000 sq. ft. of manufacturing space
- **Engineering** – Design, Modeling, and Analysis services with RPE's (US and Canada) on staff
- **Quality** - Commercial (ISO 9001), Nuclear (NQA-1 / Appendix B), DoE, and DoD programs

Nuclear Heritage

ASC Nuclear Industry Firsts (We've been here):

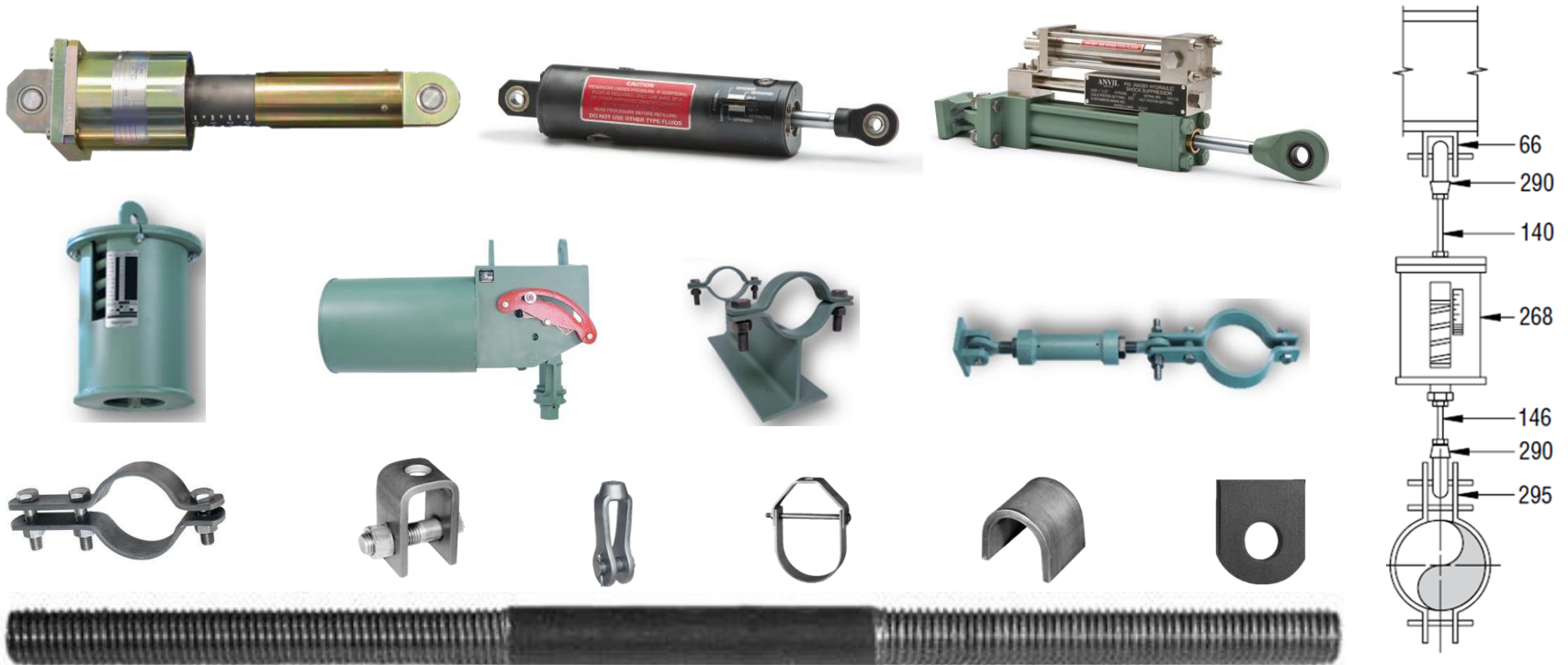
- First Nuclear Pipe Support company to qualify as an ASME supplier.
- First ASME NPT stamp.
- First ASME / NS certification of accreditation.
- First LCDS package for ASME / NF qualified supports.
- First DRS package for ASME / NF qualified supports.
- First Hydraulic snubbers to meet new ASME QME-QDR requirements.



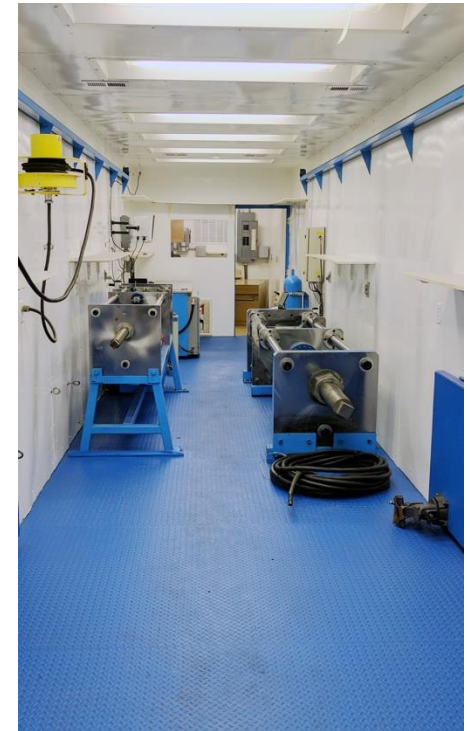
ASC Nuclear Industry Experience (We'll be here):

- Over 350+ years in safety related experience
- 30+ years of Spring and Fall outage snubber services (>70 techs)
- ASME Code Committee Memberships
 - ASME B&PVC Section III Subsection NF (Supports)
 - ASME O&M Subsection ISTD (In-Service Testing Dynamic Restraints)
 - ASME QME Subsection QDR (Qualification of Dynamic Restraints)
- Attendance at NUPIC / NIAC Conferences
- Participation in SNUG industry user group

Nuclear – Products



Nuclear – Field Services



Nuclear – Service Center (Hot Shop)



Thank you

asc-es.com

Building connections that last





Barker/Diacon

The Force in Snubber Testing

Foundation

In 1984, Barker and Diacon formed a strategic collaboration to develop specialized test machines for the nuclear industry. Barker was responsible for the design and manufacture of the hydraulic systems and mechanical components, while Diacon developed the proprietary software and data acquisition systems that controlled and monitored machine performance. Together, the two companies delivered advanced testing solutions that have supplied over 100 machines to power plants worldwide.



Snubber Testing Products

Snubber Test Bench



In-Place Tester



Test Bench Upgrade



Portable Filter Machine



Snubber Test Bench

Barker/Diacon S2000-NM Snubber Test Benches

- Designed to test all common types of snubbers
- Tests mechanical snubber acceleration and velocity limits as well as hydraulic snubber velocity limits, with or without lockup
- Includes database of setup parameters for up to 200 snubber types
- Concentrically loaded test frame provides more strength with less mass
- Simplified hydraulic design is lower cost and easier operation than servo-based systems
- Easy to read computer generated test plots provide both graphical and alphanumeric test results for accurate testing
- Available in standard bench/HPU package or as integral units with hydraulic components built into the bench

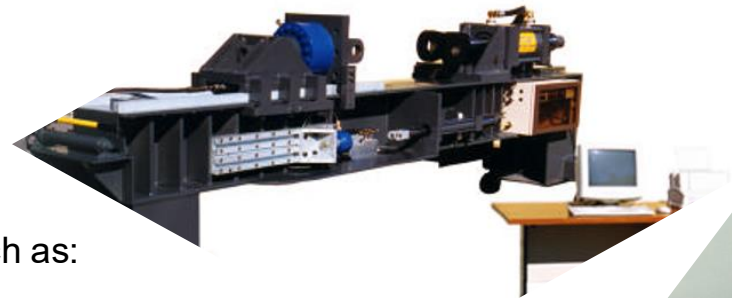


Test Bench Trailer

- We install our snubber test benches in climate-controlled trailers provided by Kentucky Trailers
- Customizable configurations available to meet plant-specific testing requirements
- Eliminates the need to transport snubbers off-site, reducing outage time and logistics costs
- Perfect for plants with multiple units or need a hot/cold side machine
- Turnkey solution including setup, operator training, maintenance, and technical support



Test Bench Upgrade



Able to upgrade a variety of test machine models such as:

- Anchor Darling I-Beam design
- Wyle Test Machines
- S4000 Barker/Diacon machines

New Load Cells and Data Acquisition System

- Load Cell accuracy to .25% full scale
- New Position and Velocity Transducers
- New State of the Art Data Acquisition System
- Up to Date Computer and Software



In-Place Tester

Model IPST-10



- Versatile, Continuous Duty Rated
- Activation Flow Rates up to 18 gpm
- Max Pressure to 12,000 psi
- Tests snubbers, filters fluid, or use as a flow bench to adjust control valves
- Operators can be up to 100 feet from test machine
- Tests snubbers from 2 ½" bore to as large as 20" bore

Portable Filter Machine

Two stage filtering system

- Stage 1 removes water and solid contaminants with a 25-micron filter
 - Impregnated paper for dirt removal
 - Open cell absorbent polymer for water removal
- Stage 2 filters suspended contaminants to 1-micron
 - Removes oxidation and decomposition products from synthetic fluids

Equipped with a timer and filter indicators that will shut down automatically if set time has passed or filters become clogged

Fluid can be poured directly into machine or drawn from external source





Thank you

Come see us at the booth!



Curtiss-Wright Nuclear Overview

Guy Levy, Sr. Manager, Business Development

Performance Overview

Broad & Integrated Portfolio

2026E Sales by End Market¹

Aerospace & Defense

70%

Aerospace,
Ground & Naval
Defense (~57%)

Commercial
Aerospace
(~13%)



Commercial

30%

Power & Process
(~19%)

Industrial
(~11%)



Leveraging Synergies and Cross-Market Opportunities throughout the Portfolio

Global Footprint

2025 Sales by Geography



100+
Countries
Served

45
Major Sites
(10 Countries)

~2.0K
Engineers

~9,100
Employees

>\$3.7B
Revenue¹

Leading provider of highly engineered and mission critical technologies in Aerospace & Defense, Commercial Nuclear Power, Process & Industrial markets.

¹ Reflects the Company's financial guidance as of February 11, 2026

Equipment, Plant Management Technology, and Services



Primary Circulation Pumps

- Reactor Coolant Pumps
- Helium Circulators
- Liquid Sodium Pumps



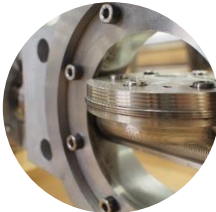
Reactivity Control Equipment

- Control Rod Drive Mechanisms
- Control Rods
- Digital Rod Position Indication and CRDM Control Systems



Containment Integrity Equipment

- Personnel Airlocks
- Equipment Hatches
- Fuel Pool Gates
- Electrical Penetration Assemblies



Flow Control Equipment

- Isolation, Control, Relief and Check Valves
- Hydraulic, Motor, Pneumatic, System Media and Solenoid Actuation
- Venturi Flow Meters



Electrical and HVAC

Equipment

- Specialty Cables and Connectors
- Flex Conduit and Seals
- Motors and Generators
- Switchgear and Relays
- Safety Related HVAC Systems



Sensors and Instrumentation

- Neutron Monitoring
- Radiation Monitoring
- Pressure, Temperature, and Level Sensors



Plant Management Technology

- Reactor Protection Systems
- Distributed Control Systems
- Simulation Assisted Engineering
- Full Scope Simulators
- Online Condition Monitoring



Engineering and Qualification Services

- Component and System Design/Integration
- Procurement Engineering
- Equipment Qualification
- Commercial Grade Dedication

Enertech Early Beginnings



PAUL-MUNROE
HYDRAULICS INC.



- Paul-Munroe Hydraulics Inc.
- California hydraulic distributor, manufacturer
- Enertech established 1987: P-M Energy Products

1952

- Technology-defined company
- Hydraulic snubbers, EHOs
- Bettis distributor



Large Bore Hydraulic Snubbers

- Designed for critical safety applications in nuclear power plants
- Installed in 100+ plants worldwide with decades of operational history
- Supports major components such as steam generators, primary coolant pumps, piping systems



Large Bore Hydraulic Snubbers

- **Provide protection to major components during a seismic event**
 - Allows for thermal expansion and contraction during normal plant operation
- **40-Year Qualification Life**
 - Snubbers are designed with a 40-year qualification life
- **Complete replacement, parts, and refurb support for:**
 - Enertech, Paul-Munroe, Anker-Holth/McDowell Wellman, E-Systems, Phoenix
- **Expanded onsite field service and outage support**



Thank You!

Questions?



www.nuclear.curtisswright.com



glevy@curtisswright.com



714-982-1832

Element: SNUG 2026 Updates



Eric Kelland
July 2026



Element Materials Technology:

The recognized leader in
Testing, Inspection and
Certification Services to a
diverse range of industry
sectors where failure is not
an option



Element Huntsville



102
Colleagues



1
Location
115 Acres
238,000 sqft

300+
Customers



2
Distinct
Business
Streams



- **T&E:** EMI/EMC, Environmental and Dynamics Testing
- **Nuclear:** Commercial Grade Dedication, Equip. Qualification, Valve & Snubber Services
- **Accreditations:** ISO/IEC 17025 (incl. Calibration Services), ISO 9001, 10CFR50 Appendix B for Nuclear

HSV Rejuvenation Project

**Total Investment
2025-2027**

CapEx Budget: \$30 m

Projects: 162

2025

CapEx Budget: \$10m

Projects Completed: 67

**SMR Test Facility
Commissioning
Phase**



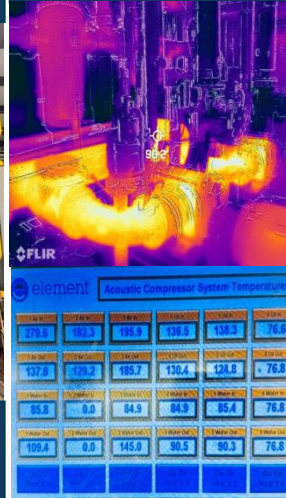
**5 Vibration Systems
installed**



**TVAC Refurbished
and Upgraded**



**Acoustic Testing
System**



TPQ Kaizen



**6 Vibration
Controllers installed**



SRV Panel Upgrade



DSTF Drainage



**High Bay & SRV &
DSTF Painted**



Snubber Services & Facilities

Turnkey services to support maintenance and surveillance programs for all types and sizes of mechanical and hydraulic snubbers:

- Snubber Services: ASME OM Code
 - Removal /Installation
 - Inspection
 - Repair & Refurbishment
- Capabilities include:
 - Procedure and work package development
 - Visual inspection, snubber removal and reinstallation
 - On-site and in-house functional testing
 - On-site and in-house repair and overhaul
 - Failure analysis
- Facilities & Equipment
 - (8) Small Bore test machines (200-130,00 lb load capability)
 - (2) Portable Large Bore test machines (1.6 million lb load capability)
 - (1) Non-Portable Large Bore test machine (2.0 million lb load capability)
 - (9) Snubber Trailers (7 test and 2 rebuild)
- Investments
 - Personnel
 - (32) New Hires, Training and Qualifications (Rigging, VT, Safety, etc.)
 - Test Machine Improvements (new hardware and software)

Snubber Department & Services



New Advanced Reactor Facility

*First of a kind test
facility supporting
SMR's and Next
Gen Nuclear*

HELB – High Energy Line Break: Qty (2)



LOCA – Loss of Coolant Accident: Vertical & Horizontal





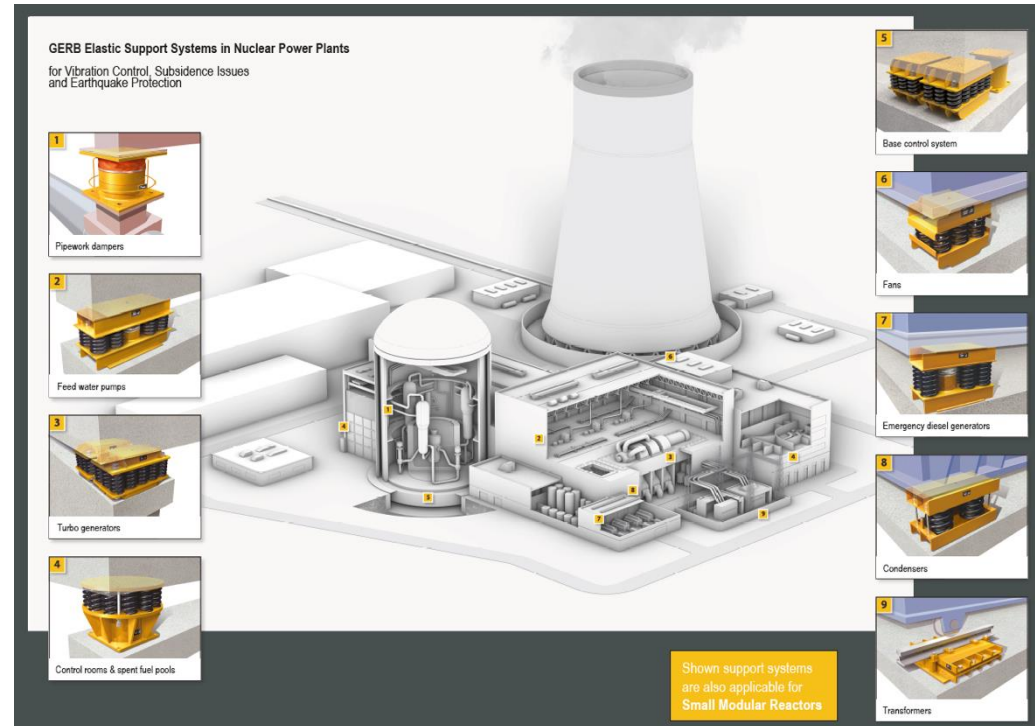
Vibration Control

Made in Germany. Since 1908. Worldwide.

Snubber Users Group

Victor Salcedo

Elastic Support Systems in Nuclear Facilities

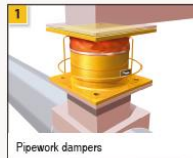


Elastic Support Systems in Nuclear Facilities



GERB Elastic Support Systems in Nuclear Power Plants

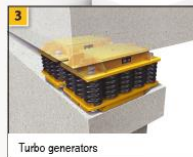
for Vibration Control, Subsidence Issues
and Earthquake Protection



Pipework dampers



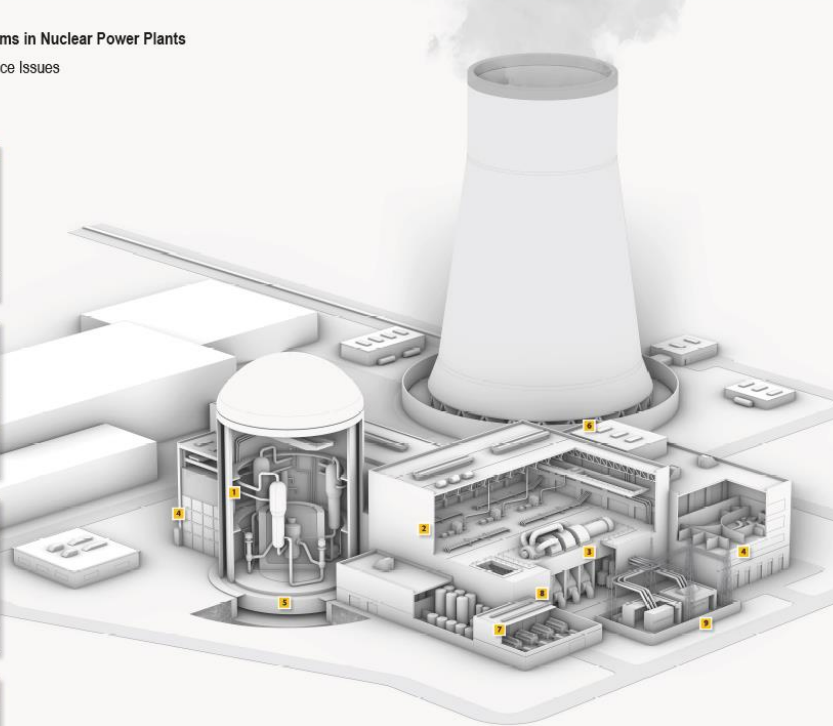
Feed water pumps



Turbo generators



Control rooms & spent fuel pools



Base control system



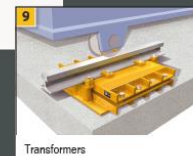
Fans



Emergency diesel generators



Condensers



Transformers

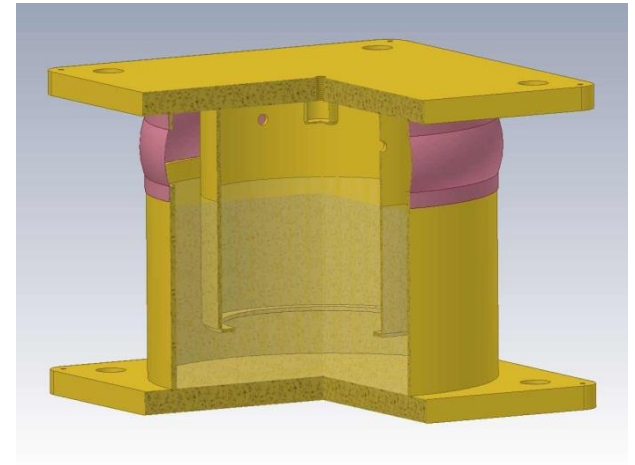
Shown support systems
are also applicable for
Small Modular Reactors

Supplemental Damping of Pipe Systems



Pipework dampers

More than 5000 pipework dampers installed worldwide
Including US NPP Main Steam Lines



NPP Pipe Damper Applications



- Arkansas Nuclear One: Vent lines in containment of PWR
- Waterford 3: Feed Water in PWR
- TVA Browns Ferry; MSL in BWR
- Grand Gulf: Turbine stop valves
- Cooper Nuclear: MSL in BWR
- Riverbend NPP: EDG Turbocharger
- Calvert Cliffs: MSL
- And many others



Seismic Isolator ASME Code Applicability

- *Viscoelastic Dampers, along with snubbers, are recognized as dynamic restraint in the ASME B&PVC Section III – NF*
- *The Seismic Isolators are considered active mechanical equipment and shall be qualified in accordance with ASME QME-1 (QDR)*
- *In-service inspection may comply with the rules of ASME BPVC, Section XI, Division 2, 2021 Edition.*
- *GERB has an approved QA program meeting the requirements of 10 CFR 50 appendix B, 10 CFR Part 21, ASME NQA-1-2015 and ASME NS Certificate .*



The American Society of Mechanical Engineers

CERTIFICATE OF AUTHORIZATION

This certifies the named company as having had the adequacy of their quality assurance program verified for the scope of the activity shown below in accordance with the applicable rules of the Boiler and Pressure Vessel Code of The American Society of Mechanical Engineers (ASME). This certificate does not include authorization to use the ASME Single Certification Mark. The certification granted by this certificate is subject to the provisions of the agreement set forth in the application.

COMPANY:

GERB Schwingungsisolierungen GmbH & Co. KG
 Roedernallee 174-176
 Berlin 13407
 Germany

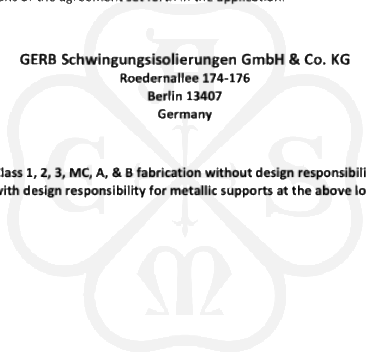
SCOPE:

Class 1, 2, 3, MC, A, & B fabrication without design responsibility
 and with design responsibility for metallic supports at the above location only

AUTHORIZED: **June 20, 2025**

EXPIRES: **June 20, 2028**

CERTIFICATE NUMBER: **N-4895**





Board Chair,
Conformity Assessment





Senior Director,
Engineering Operations

VIBRATION CONTROL & SEISMIC PROTECTION IN NUCLEAR POWER PLANTS



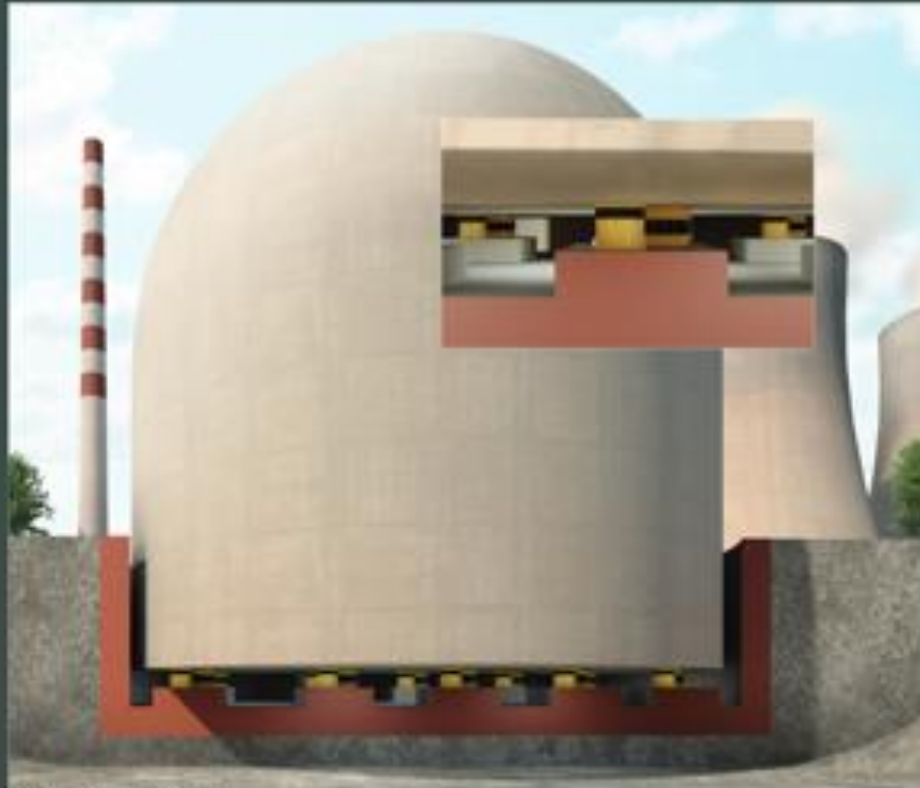
Spent fuel storage pool



Emergency diesel generators on
Spring-Viscodamper® Combination



Turbine table isolation on
GERB Spring elements



3D Base Control System



Safety related piping

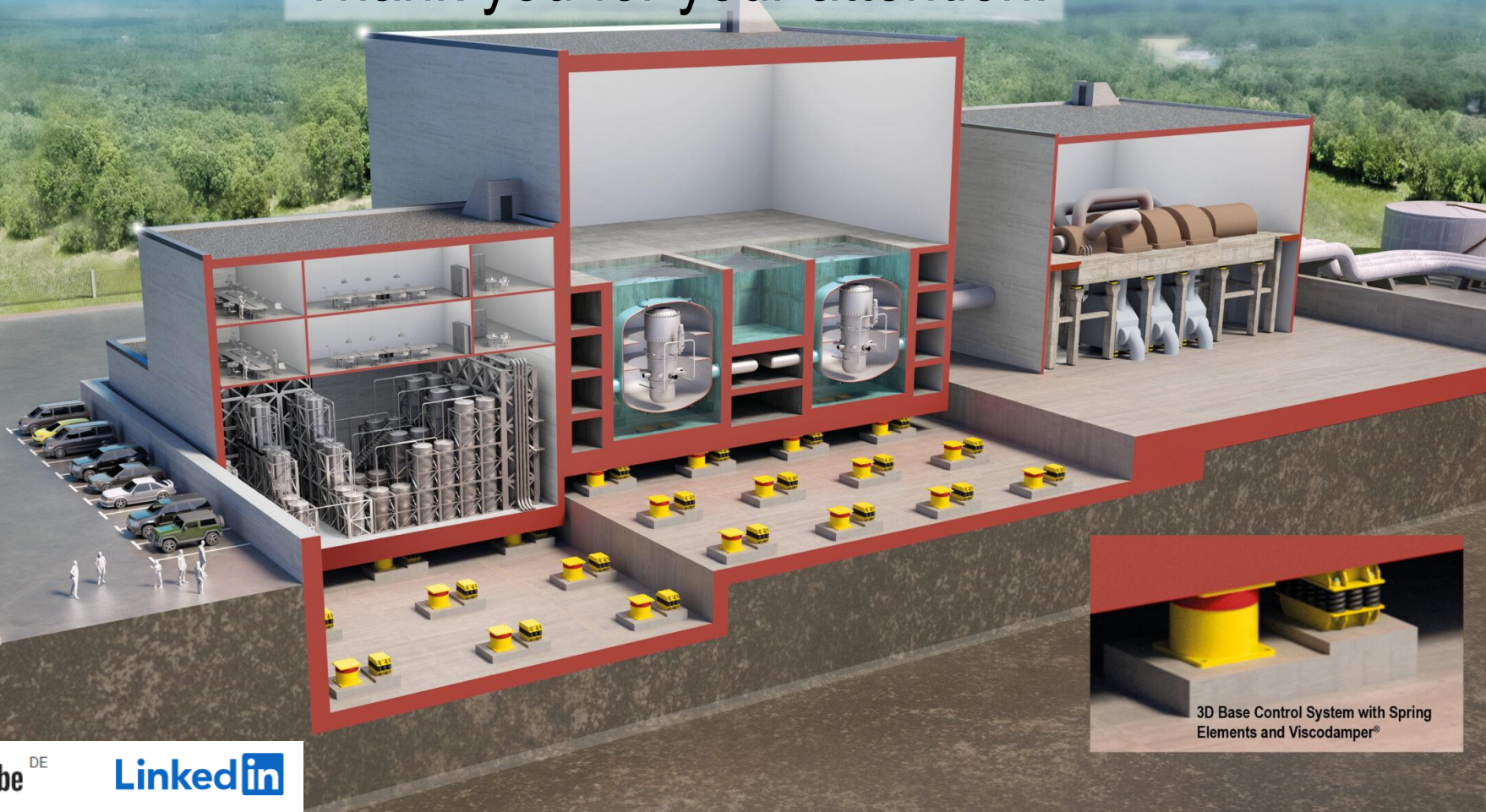


Seismic protection for substation
equipment in California



GERB holds an ASME 'NS' Certificate
of Accreditation.

Thank you for your attention!



GSE Solutions Corporate Overview

SNUG JULY 2026



Who We Are



GSE Solutions supports nuclear power and clean-energy fleets worldwide through integrated engineering services and software that strengthen operational performance. Our experts, including many former nuclear utility professionals, combine decades of experience with modern best practices to help customers reduce rework, cost, and risk.

About GSE Solutions

- More than five decades of proven industry experience
- Hundreds of customers in over 50 countries
- Delivering advanced engineering services and cutting-edge software to nuclear power and energy facilities
- Engineering design and analysis to programs, plant performance, compliance, and simulation
- GSE supports the future of clean energy production and the decarbonization of the power industry
- Headquartered in Columbia, Maryland
- ISO 9001-2015, ANSI N45 App B
- Privately owned by Pelican Energy Partners a growth equity investor dedicated to expanding nuclear energy services to support the sector

Over 50 Years in the Making



1970s

IN THE BEGINNING

Originally Link Simulation, a division of the Singer Co., GSE built the first-ever nuclear simulator, derived from their WWII pilot simulators.



1980s

BUILDING A STRONG FOUNDATION IN NUCLEAR POWER

GSE leads the industry with over 1,100 installations, setting the benchmark in high-fidelity nuclear simulation.



1990s

SHAPING THE FUTURE OF POWER OPERATIONS

Leveraging cutting-edge technology and advanced software to enhance and modernize the future of nuclear and power generation.



2000s

INVESTING IN ENGINEERING EXCELLENCE

GSE broadens portfolio in design engineering, simulation, thermal performance, and engineering program services.

2010 - EnVision
2018 - True North Consulting
2019 - DP Engineering
2026 - Iddeal Concepts



2020s

SUPPORTING CARBON-FREE ELECTRICITY & BETTER PERFORMANCE

GSE Solutions was formed to leverage its multidiscipline expertise, advanced engineering services and cutting-edge software to bring more value to customers

IN THE NEWS

GSE Acquires Iddeal Strengthening Nuclear Engineering Program Capabilities





“Iddeal has built a strong reputation in Enterprise IT solutions, on-site services, and Engineering Program services, with 25 years of experience. Together with GSE’s Engineering Programs expertise, we are better positioned to lead in a consolidating market while maintaining the high level of service our customers expect.”

GSE Solutions Acquires Iddeal Concepts

- GSE Solutions has acquired Iddeal Concepts – enterprise IT solutions and data management software, Iddeal Services – project management, on-site support and training, and Iddeal Solutions, a full-service Engineering Program services and support company for ASME Section XI Inservice Inspection and O&M Code Inservice Testing programs and plant implementation, expanding our Engineering Program capabilities and strengthening our technical depth in ASME Code programs.
- The purchase also brings the IDDEAL Software Suite® which integrates information on defined requirements, industry regulations and standards, plant components, systems, and examination programs—facilitating easier, more efficient organization, scheduling, and tracking of all engineering, inspection, and examination work.
- This acquisition adds specialized expertise across ASME Section XI ISI, OM Code IST, enterprise IT, on-site services, and the IDDEAL Software Suite®—further strengthening GSE’s Programs & Performance division and the value we deliver to nuclear utilities.

INVESTING IN ENGINEERING EXCELLENCE

2010



EnVision Systems,
originally founded in 1991,
specialized in interactive
multimedia tutorials and
generic simulation models
for the oil, gas, and refining
sectors.

2018



True North Consulting, LLC

a specialty engineering firm
primarily to the nuclear
power industry, with
expertise in in-service testing
for engineering programs
focused on ASME OM code
including Appendix J, balance
of plant programs, thermal
performance, in-service
inspection for specialty
engineering including ASME
Section XI, and software
solutions.

2019



DP Engineering Ltd.

a specialized provider of
high-value engineering
services and solutions to the
nuclear power industry. DP
Engineering is known by its
clients as a responsive and
experienced organization
that brings technical
knowledge and creativity to
their projects.

2026



Iddeal Concepts

The deal includes Iddeal
Services and Iddeal
Solutions, bringing the
proprietary **IDDEAL
Software Suite®** and
expertise in ASME Section
XI inservice inspection
and O&M Code inservice
testing programs to
GSE's Programs &
Performance division.

Maximizing Fleet Performance Through Integrated Services



DESIGN ENGINEERING MODS & UPGRADES

Leverage end-to-end engineering design modifications and upgrade solutions with specialized experts who ensure precise, timely delivery.



SIMULATION & MODELING SOLUTIONS

Use simulation to train employees, mitigate risks, validate control strategies, assess human factors, and improve procedures using real-world scenarios.



PERFORMANCE & MW OPTIMIZATION

Achieve megawatt improvement, increase efficiencies, reliability, and optimization of power/fuel ratios to drive substantial cost savings.



ENGINEERING PROGRAMS SUPPORT

Navigate regulatory requirements to meet complex regulations with a proactive team at the forefront of technology, strategy, and emerging trends.



BALANCE OF PLANT SERVICES

Improve reliability, efficiency, and asset longevity across all systems, enabling safer operations, lower lifecycle costs, and sustained long-term performance.

Performance-Driven Plant Engineering Services

DESIGN ENGINEERING

- ✓ Mechanical
- ✓ Electrical & I&C
- ✓ Civil & Structural
- ✓ Fire Protection
- ✓ Digital Upgrades
- ✓ Cyber Security
- ✓ Standard Design Process
- ✓ Model-Informed Analysis
- ✓ High-Quality Mod Packages
- ✓ System Performance Analysis
- ✓ Specialty Mechanical & Structural Analyses

SIMULATION SOLUTIONS

- ✓ High-Fidelity Simulators
- ✓ Simulation for Engineering
- ✓ Generic & Classroom Simulators
- ✓ Cloud-based Simulation & Training
- ✓ Simulation-assisted Design Engineering
- ✓ Virtual Commissioning
- ✓ Advanced Modeling
- ✓ Derisking Modifications
- ✓ Modification Planning Insights
- ✓ Operational Troubleshooting

THERMAL PERFORMANCE

- ✓ Assessment Modeling
- ✓ Heat Balance Analysis
- ✓ Thermal Performance
- ✓ Measurement Uncertainty Recapture (MUR)
- ✓ Data Validation
- ✓ Reconciliation (DVR)
- ✓ Online Monitoring
- ✓ Training Courses
- ✓ Thermal Performance Software Tools

ENGINEERING PROGRAMS

- ✓ ASME OM Code
- ✓ ISI/IST Programs
- ✓ Appendix J
- ✓ 10 CFR 72 Compliance
- ✓ Code Reconciliation
- ✓ Inspection Scope Optimization
- ✓ Procedure Development
- ✓ Training Courses
- ✓ EP Software Tools
- ✓ Aging Management Programs

BALANCE OF PLANT

- ✓ Flow Accelerated Corrosion (FAC) Programs
- ✓ Erosion / Mechanical Degradation Programs
- ✓ Underground Piping and Tank Programs
- ✓ Raw Water & Service Water Programs
- ✓ Heat Exchanger Programs
- ✓ CHECWORKS Pass 2 Calibration Software
- ✓ License Renewal & Subsequent License Renewal

Utilizing Cutting-Edge Software to • Bridge the Digital Gap



High-Fidelity Modeling • Cloud-based Training • Thermal System Monitoring • Engineering Programs Software

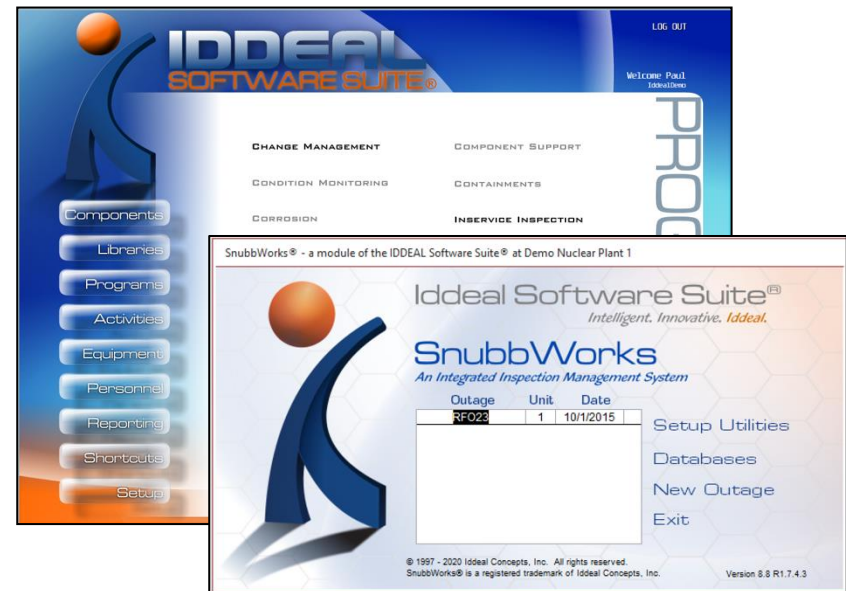
GSE's platform provides essential software tools designed to seamlessly integrate legacy systems with modern digital solutions. Our experts deliver a strategic, forward-thinking approach to plant modernization. This allows you to make informed decisions and implement upgrades at your own pace, ensuring a smooth and controlled transition to modernized operations.

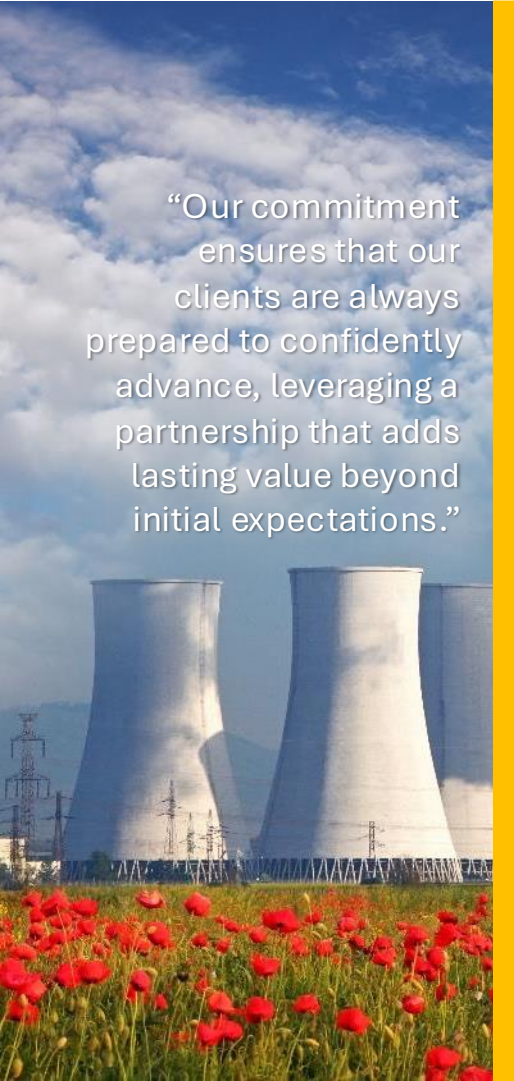
Engineering Programs Software Solutions

EP+ Engage



IDDEAL Software Suite





“Our commitment ensures that our clients are always prepared to confidently advance, leveraging a partnership that adds lasting value beyond initial expectations.”

Why GSE

- **Over 50 years of experience** in the nuclear power industry
- A deep bench of well-known, **industry-leading experts**
- Commitment to **precision** in every deliverable
- **Agile** business model for faster responses
- **High-quality** standards in all our work
- **Collaborative** approach with open communication
- **Tailored** services boost efficiency and extend operational life
- **Innovative solutions** enhance performance, support the generation of safe, carbon-free electricity and drive substantial cost savings
- **One company** delivering a wide range of focused solutions from engineering design and analysis to programs, plant performance, compliance, and simulation

Experienced Leadership

Matthew King - Manager of Engineering Programs

- Primary focus is specifically in site-support of ASME Code Programs (IST, App J, ISI, CISI, RI-ISI, and EQ) and project management
- Over 14 years of Nuclear Industry Experience

Scott Esposito - Engineering Programs Subject Matter Expert

- Primary focus is specifically in site-support of ASME Code Programs (ISI, IVVI, S/G, IST, and Snubbers) and project management
- Over 35 years of Nuclear Industry Experience

Patrick Peterson - Manager of Site Services and Training

- Primary focus is specifically in site-support of software implementation, training, and project management
- Over 40 years of Nuclear Industry Experience



info@gses.com



www.gses.com



[company/gse-solutions](https://www.linkedin.com/company/gse-solutions)

Contact Us

Sunny DeMattio

Director of Marketing

sunny.demattio@gses.com

+1 410.970.7800

Matthew King

Manager of Engineering Programs

matthew.king@gses.com

Scott Esposito

Project Manager/SME

scott.esposito@gses.com

Patrick Peterson

Director of Site Services and Training

patrick.peterson@gses.com



Kentucky Trailer Overview

July 13th, 2026



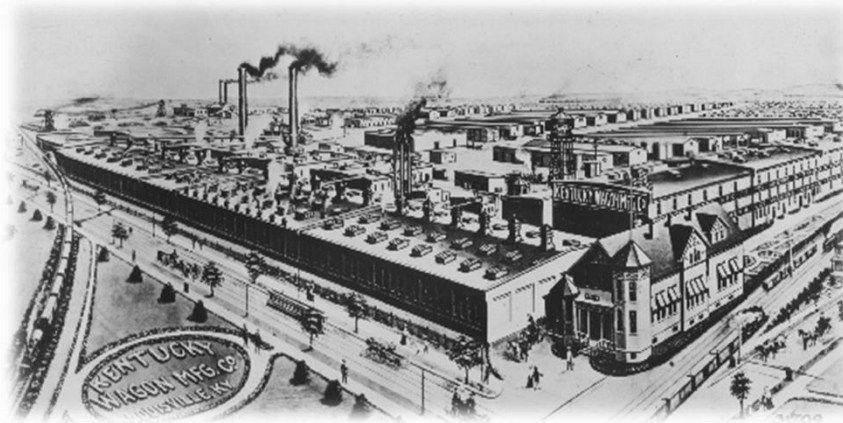
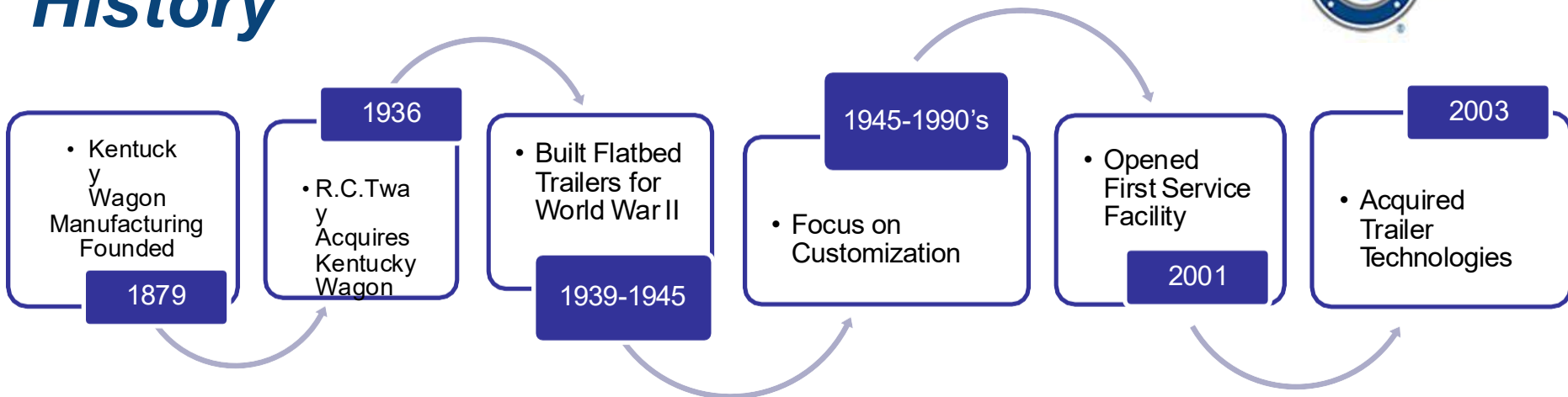
A Marmon |
Berkshire Hathaway
Company

Agenda



- Quick History
- Facilities Overview
- Markets Served & Product Offerings
- Key Customers + New Direction

Kentucky Trailer History



The Original Kentucky Wagon Manufacturing Company



A History of Innovation and Growth



- Kentucky Trailer opens new plant at Logistics Drive

2009

2010

- Kentucky Trailer acquires service facility in CA

- Alleghany Corp. acquires Kentucky Trailer

2014

2014-2015

- Kentucky Trailer enters mobile medical market

- Kentucky Trailer enters animal feed transportation market

2018-2019

2022

- Berkshire Hathaway acquires Alleghany



Louisville, KY Trailer Manufacturing Plant

Kentucky Trailer Manufacturing Facility



- 240,000 square foot facility
- Designed for mixed model and high-volume custom production
 - Line #1 High Labor - Custom Trailers
 - Line #2 High Speed Line – Trailers and Truck Bodies

Kentucky Truck Body Facility - Louisville



- 80,000-square-foot facility
- Capacity for 1,300 truck bodies annually
 - Production Line mixed with bay build layout

Service Facilities — Kentucky, Alabama and California



- 90,000-square-foot facility
- Specializes in Reconditioning & Modification of Specialized Trailers
- Additionally houses our Research & Development Lab

Key Markets Served - Trailers



Moving & Storage



Dry-Freight Snack Food



Air Package Delivery



Beverage



LTL + Other Specialty Freight



Enclosed Auto Transport Shells

Key Markets Served – Truck Bodies



Traditional Moving & Storage



Air Package Delivery



Rental Truck Bodies



Snack Food Delivery



Final Mile + Other Freight

Core Customers – Legacy

vs. New



“Legacy” Kentucky Trailer



“New” Kentucky Trailer



1. Maintain #1 position in moving & storage trailers and truck bodies
2. Expand our presence into beverage, especially with PepsiCo while maintain Frito-Lay position
3. Maintain sole source positioning with UPS Air Division
4. Replace competitive composite trailer accounts (i.e. FedEx) with strategic truck body accounts and mid-sized specialty freight customers



LISEGA

Company Overview

Dave Dutrow
Nuclear Sales Manager

Located in Kodak, TN



LISEGA Facilities

Zeven, Germany



*Zeven, Germany –
Main plant*

Kodak, TN



Kodak, USA

Bondoufle, France



Bondoufle, France

Shanghai, China



Shanghai, China

New Delhi, India



Al-Jubail, Saudi Arabia

Netherton, England



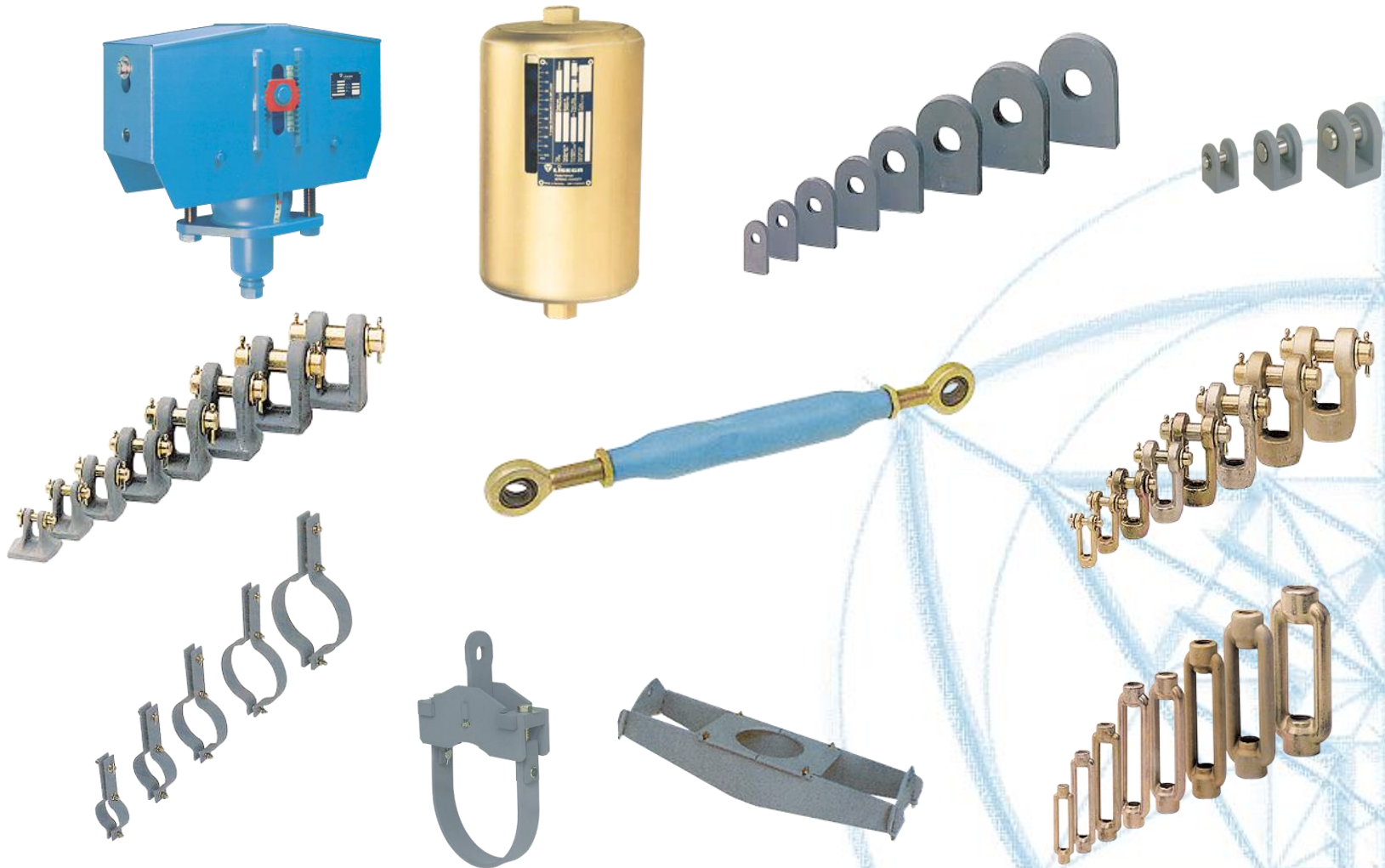
Netherton, England

Wittenburg, Germany

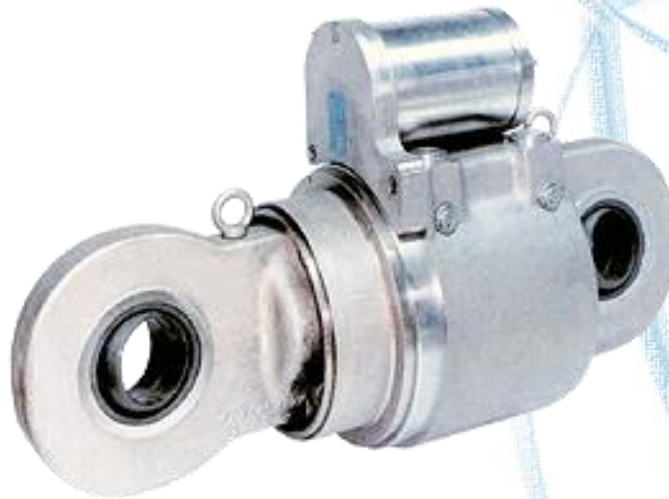


*Wittenburg, Germany
(LISEGA affiliate for
connections)*

LISEGA Parts



Piping & Large Bore Snubbers





Lunch



Building connections that last™

RETURN BY 1:00 PM

ADMINISTRATIVE ITEMS

STEPHANIE MCCORMICK

○ General Items

- Question Cards / Benchmarking Cards

○ Agenda Overview

- SNUG Website Update
- A Review of Visual Examination Requirements
- Reconciling Code Differences on New and Rebuilt Snubbers
- 2:30 PM – Beverage Break
- Snubber Mythbusters
- Rebuilding Lisega Snubbers
- Question Cards
- SNUG Inc. Business Meeting
- Daily Adjournment
- Group Event



SNUG Website Updates

Serena O'Donnell

snubberusergroup.org



About the Website



[About](#) [Meetings & Events](#) [News](#) [Partners](#) [Contact Us](#) [Member Login](#)



About

Meetings & Events

News

Partners

Contact Us

Member Login

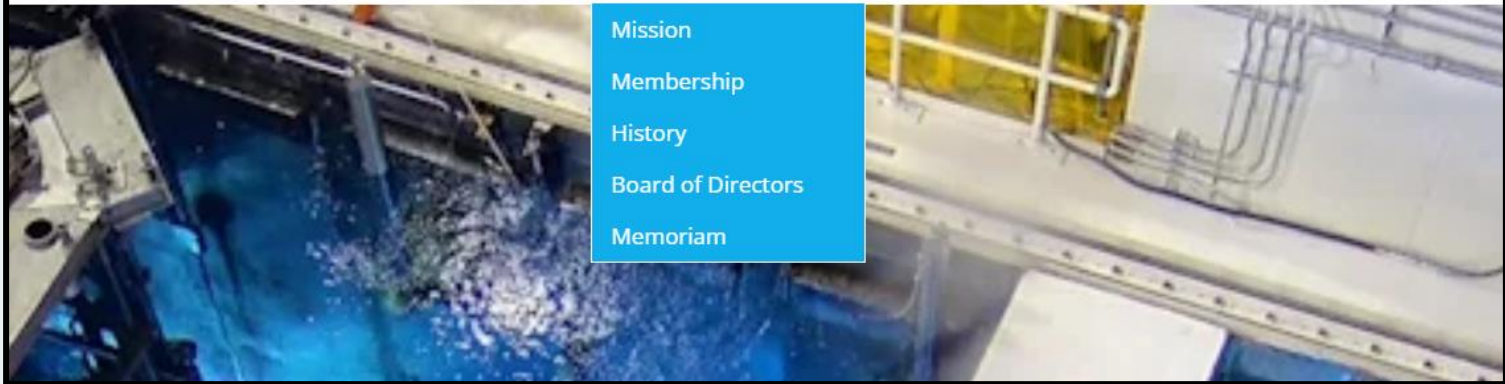
Mission

Membership

History

Board of Directors

Memoriam



Mission
Membership
History
Board of Directors
Memoriam

MISSION

OUR MISSION STATEMENT

The SNUbber Users Group will strive to improve the reliability and cost effectiveness of snubber programs at nuclear power facilities. We will accomplish this by providing a forum for the open exchange of technical information and ideas, by providing training opportunities, by serving as a primary source of input to ASME Code organizations, and by aggressively pursuing cost effective solutions to concerns and issues that impact the nuclear power industry.

BECOME A MEMBER

OUR OBJECTIVES

To achieve our mission, the SNUbber Users Group and its members will:

- Acquire and exchange information on the design, manufacturing, qualification, maintenance, examination, testing and service life monitoring of snubbers.
- Initiate and conduct workshops and other training opportunities in order to promote consistency and maintain an industry wide knowledge base in response to workforce organizational changes.
- Address licensing issues related to snubbers and disseminate information on codes, standards and regulations affecting snubbers.
- Act as a liaison to the ASME Code organization by providing information and feedback on code related issues.
- Utilize Working Groups as needed to address significant issues, report findings and recommend actions to SNUG members as appropriate.
- Develop and maintain a working relationship with snubber manufacturers, vendors and regulators.

Mission
Membership
History
Board of Directors
Memoriam

MEMBERSHIP

MEMBERSHIP LEVELS:

Full Member:
Available to foreign or domestic commercial nuclear generating facilities or plants

Limited Member:
Available to foreign or domestic non-nuclear or non-generating facilities which incorporate snubbers into their design

Interim Member:
Available to non-member facilities who are eligible and considering membership

MEMBERSHIP RIGHTS:

Full and Limited Members:
Entitled to send representatives to participate in conferences and vote in all corporate decisions.

Interim Member:
Entitled to send representatives to attend conferences only. This membership level is limited to one year or two conferences.

MEMBERSHIP REQUIREMENTS:

- Full and Limited Members:**
- Payment of membership fee
 - Periodic submittal of requested facility information
 - Provide a representative to attend conferences

Name *(Required)*

First

Last

Title

Organization *(Required)*

Phone *(Required)*

Email *(Required)*

SUBMIT

Mission
Membership
History
Board of Directors
Memoriam

SNUG HISTORY

The **Snubber Utility Group** began at a [December 6, 1984 snubber information exchange meeting](#) in St. Petersburg, Florida. Twenty-six attendees representing eighteen utilities attended the meeting, hosted by Florida Power Corporation. The attendees decided that a Snubber Utility Group would be formed with the following goals:

- 1. Proactively interact as a united utility group with the NRC, vendors, and ASME Code Committees on snubber matters.
- 2. Share snubber information among the member utilities.
- 3. Increase utility members' efficiency in the procurement of snubbers and snubber related materials through the use of a snubber database.

Two specific items were identified as immediate concerns to be addressed by the group:

- 1. [Attachment2 – 1984 Outline for OM-4 Response to NRC concerns](#) regarding large bore snubbers (Generic Issue 113).
- 2. Revision of Technical Specification requirements for visual examinations and ASME OM-4 ([1983 design outline](#)).

The newly formed group elected officers and a Core Committee to provide leadership and continuity. At that time, it was also determined that the group would meet on a semiannual basis.

Mission

Membership

History

Board of Directors

Memoriam

BOARD OF DIRECTORS

Tim Canter
Duke Energy
Email: tim.canter@duke-energy.com

Ed Dundon
Dominion Energy
Email: edward.f.dundon@dominionenergy.com

Mitch Etten-Bohm
Southern Nuclear Operating Company, Corporate
Email: mettenbo@southernco.com

Scott Esposito
Retired
Email: scottespo@outlook.com

Bob Fandetti
Retired
Email: bob@r-d-racing.com

Nate Frank
American Electric Power
Email: nbfrank@aep.com

Stephanie McCormick
Tennessee Valley Authority
Email: slmccormick@tva.gov

Steve Norman
Enercon Services, Inc.
Email: snorman@enercon.com

Serena O'Donnell
Constellation, Corporate
Email: serena.o'donnell@constellation.com

A. P. Smith
Dominion Energy
Email: ap.smith@dominionenergy.com

Jeff Stallman
Pacific Gas & Electric Company
Email: j71y@pge.com

- Mission
- Membership
- History
- Board of Directors
- Memoriam

MEMORIAM

We honor those who came before us – our colleagues, mentors, and innovators who gave themselves to the snubber industry and the people within it. Their dedication, expertise, and character shaped not just the work we do, but the culture and community we are proud to be a part of. The individuals honored here have left behind legacies that extended far beyond any title or achievement. Although they are deeply missed, they will never be forgotten.

[About](#)[Meetings & Events](#)[News](#)[Partners](#)[Contact Us](#)[Member Center](#)[Annual Business Meeting](#)[SNUG Summer Conference & Trade Show](#)[SNUG Winter Conference](#)

MEETINGS & EVENTS



SNUG Annual Business Meeting

July 13 – 15, 2026

DoubleTree by Hilton St. Paul
411 Minnesota Street
St. Paul, MN 55101



Summer 2026 SNUG Conference & Trade Show

July 13 – 15, 2026

DoubleTree by Hilton St. Paul
411 Minnesota Street
St. Paul, MN 55101

Reservations: (651)-291-8800



2025 Outage Reporting – Winter SNUG Conference

Virtual Meeting January 29, 2026

[About](#)[Meetings & Events](#)[News](#)[Partners](#)[Contact Us](#)[Member Center](#)

NEWS

Current Issues that are being addressed by SNUG include the following:

[BECOME A MEMBER](#)

SERVICE LIFE / LIFE EXTENSION / LICENSE RENEWAL

A Working Group is addressing issues related to snubber service life. Due to increased activity in the area of plant license renewal and plant life extension, there are concerns with regard to snubber service life issues. Some of the concerns being addressed include determining acceptable methods of monitoring service life, preventive maintenance activities needed to extend service life, and cost effective corrective actions when service life is reached. This is a priority effort addressing this area as an emerging area of concern.

TRAINING / KNOWLEDGE RETENTION

A Working Group is addressing the needs of the industry for training in the area of snubber program management and implementation, as well as providing for the retention of a wide knowledge base in view of an increasing trend in personnel turnover. A large portion of the knowledge required for successfully managing and implementing a snubber program is experiential in nature, and personnel turnover has had a negative impact upon the knowledge base of the industry as a whole. The Working Group is tasked with identifying areas of need where SNUG can either lead or facilitate training and informational workshops. Opportunities to be investigated include the continuation

[About](#)[Meetings & Events](#)[News](#)[Partners](#)[Contact Us](#)[Member Center](#)

PARTNERS

To accomplish our mission, SNUG utilizes a variety of methods to coordinate the efforts and resources of [member plants](#) as well as those of manufacturing and service vendors. Our partners are an essential part of our success. Partners are provided the opportunity to participate at the [Summer Conference and Trade Show](#) to present their latest technology available or methodology that has been used successfully in the past in solving issues related to snubbers.





- [About](#)
- [Meetings & Events](#)
- [News](#)
- [Partners](#)
- [Contact Us](#)
- [Member Center](#)



CONTACT US

Name *(Required)*

First

Last

Corporate Office:
2168 Harrison Road
Dothan, AL 36303

Title

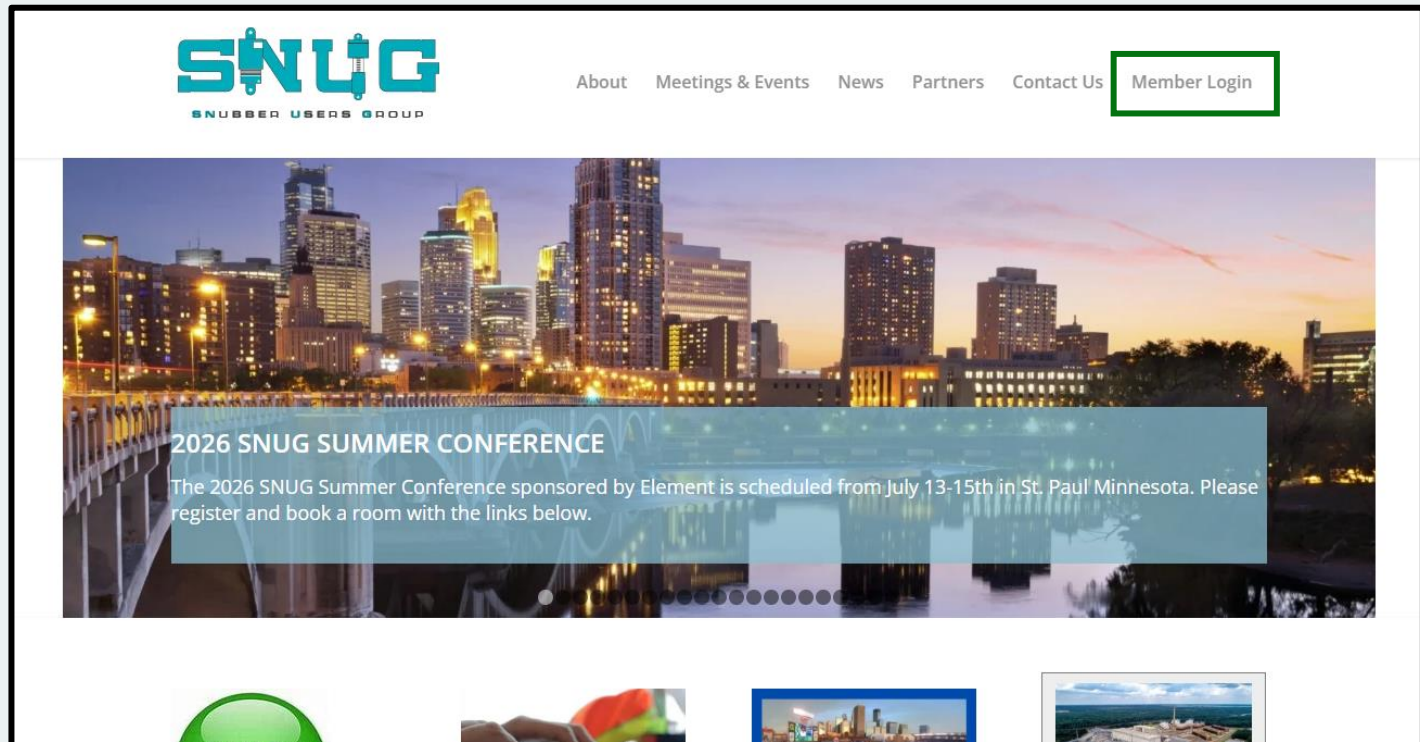
Organization *(Required)*

Phone *(Required)*

Email *(Required)*

Reason for Contact

Logging In – Returning Members



Select the Member Login button on the top right and sign in



BECOME A MEMBER

As an information sharing organization, SNUG strives to improve the reliability and cost effectiveness of snubber programs at nuclear power facilities by communicating with each other and sharing best practices and new ideas. We provide an open exchange of technical information, outage related statistics on snubber functional testing, visual examination, service life monitoring, regulatory enforcement and other program related topics. If your plant site is not a SNUG member, but would like to be one, click the button below to get started.

CLICK ME



Logging In –New Members

MEMBERSHIP

MEMBERSHIP LEVELS:

Full Member:

Available to foreign or domestic commercial nuclear generating facilities or plants

Limited Member:

Available to foreign or domestic non-nuclear or non-generating facilities which incorporate snubbers into their design

Interim Member:

Available to non-member facilities who are eligible and considering membership

MEMBERSHIP RIGHTS:

Full and Limited Members:

Entitled to send representatives to participate in conferences and vote in all corporate decisions.

Interim Member:

Entitled to send representatives to attend conferences only. This membership level is limited to one year or two conferences.

MEMBERSHIP REQUIREMENTS:

Full and Limited Members:

- Payment of membership fee
- Periodic submittal of requested facility information
- Provide a representative to attend conferences
- Protect the proprietary status of corporate information

Name *(Required)*

First

Last

Title

Organization *(Required)*

Phone *(Required)*

Email *(Required)*

SUBMIT

Member Center

MEMBER CENTER

Here in the Member Center you have access to:

- [The Forum](#)
- [Resource Library](#)
- [Member Directory](#)

- The Forum

- Resource Library
- Member Directory

Available Forums

Forum	Posts
ASME Codes	0
Conferences & Trade Shows	0
Functional Testing	14
Hydraulic Snubbers	2
Inservice Testing Owners Group (ISTOG)	5
Mechanical Snubbers	0
Personnel Qualification	4
Program Assessments	2
Program Documents	0
Service Life Monitoring	1
Visual Examination	1

Topic Title (Maximum Length: 80):

b **i** link **b-quote** **del** **img** **ul** **ol** **li** **code** **close tags**

Limit to Group (To select multiple items in a list, hold down the Ctrl (PC) or Command (Mac) key.):

By default, notifications of posts are sent to all users.

If you would like your post to be restricted to specific groups, then select only those groups below

-- No Limit --

Administrator

Editor

Author

Contributor

Subscriber

Topic Tags:

Topic Type:

Normal

Topic Status:

Open

☒ Notify me of follow-up replies via email

Submit

- The Forum
- Resource Library
- Member Directory

RESOURCE LIBRARY

The folders below contain the documents currently stored in the resource library. Should you wish to have additional documents considered for storage in the library, please use our [form for uploading](#). Once uploaded, our staff will review the document and, if determined to be appropriate for storage on our website, will be added to an existing folder. If a folder does not currently exist for your submitted document, a new folder will be created.

DOCUMENT UPLOAD
FORM

Search:

-  ASME Codes
-  Conference Planning Committee Files
-  Board Members Only
-  Database
-  General Interest
-  Hydraulic Snubbers
-  Regulatory Related Issues
-  Mechanical Snubbers
-  Meeting & Event Documents
-  Organizational Matters
-  Snubber Reduction
-  Test Machines and Methodology

- The Forum
- Resource Library
- Member Directory

RESOURCE LIBRARY

The folders below contain the documents currently stored in the resource library. Should you wish to have additional documents considered for storage in the library, please use our [form for uploading](#). Once uploaded, our staff will review the document and, if determined to be appropriate for storage on our website, will be added to an existing folder. If a folder does not currently exist for your submitted document, a new folder will be created.

DOCUMENT UPLOAD
FORM



Search:

-  ASME Codes
-  Conference Planning Committee Files
-  Board Members Only
-  Database
-  General Interest
-  Hydraulic Snubbers
-  Regulatory Related Issues
-  Mechanical Snubbers
-  Meeting & Event Documents
-  Organizational Matters
-  Snubber Reduction
-  Test Machines and Methodology

DOCUMENT UPLOAD

To upload a document for review to be placed on the website, please use the form below.

Name *(Required)*

First

Last

Email *(Required)*

Company *(Required)*

Name of File

Description of file

Please include a short description of the file to be uploaded. This description may be used on the website, and help in determining in what category it belongs.

File *(Required)*

You may upload one document at a time.

No file chosen

Accepted file types: pdf, doc, docx, ppt, pptx, Max. file size: 256 MB.

UPLOAD

- The Forum
- Resource Library
- Member Directory

USER DIRECTORY

SEARCH USERS

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z _ * ↑

Displaying 1-10 of 65 1 2 3 ... 6 7 Next »

AVATAR	FIRST NAME	LAST NAME	COMPANY	POSITION	EMAIL	PHONE 1	PHONE 2	ADDRESS
								
								
								

Thank You

Visual Examination of Snubbers

Summer 2026 Conference

July 13, 2026

St. Paul, MN

By: Scott Esposito

PURPOSE

WHY:

Increase Visual Examination Requirements knowledge

BENEFIT:

Gain a Better Understanding of Visual Examination Requirements

ACCEPTANCE CRITERIA GUIDANCE

- Non-Mandatory Appendix B
 - Inadequate fluid level
 - Loose, missing or incorrect fasteners
 - Vented reservoir orientation
 - Corrosion
 - Deformed
 - Item that prohibit proper movement
 - Partially disengaged spherical bearing
 - Inadequate piston setting

PRESERVICE REQUIREMENTS

- Initial examination prior to startup
- New or Modified Systems - prior to declaring it operable
- New Snubber on an existing system – may not require thermal movement or swing angle verification
- Reexamination – when preservice exceeds initial system preoperational test by 6 months

PRESERVICE REQUIREMENTS

- No visible signs of damage or impaired operability
- Proper load rating, location, orientation, setting in accordance with design drawing.
- Adequate swing angle
- Proper fluid level

PRESERVICE REQUIREMENTS

- Proper structural connections
- Thermal movement and swing angle shall be verified during heatup and cooldown.

INSERVICE REQUIREMENTS

- Scheduled frequency
- Examination checklist shall be used
- Categorize populations
- Capable of restraining movement
- Allow thermal movement
- Free of defects

INSERVICE REQUIREMENTS

- Many of the same requirements as Preservice Exams – but not all
- Examined prior to Maintenance or Testing
- ISTD-5224 Bench Test
 - After reinstallation, the applicable requirements of ISTD-4200 shall be met. Also, the position setting shall be verified.

MECHANICAL SNUBBER VISUAL EXAMINATION

Mechanical Snubber



INSERVICE MECHANICAL SNUBBER EXAMINATION

Direct or Remote Examination

- Verify proper setting
- Loose fasteners
- Fretting particles
- Signs of heat degradation - discoloration

INSERVICE MECHANICAL SNUBBER EXAMINATION

- Signs of fretting



INSERVICE MECHANICAL SNUBBER EXAMINATION

- Verify that the snubber is aligned properly and is not bound at the end attachments
- Check the support cylinder for objects adjacent to the snubber which could restrict movement

INSERVICE MECHANICAL SNUBBER EXAMINATION

- Missing washers



INSERVICE MECHANICAL SNUBBER EXAMINATION

- Improperly installed load stud



HYDRAULIC SNUBBER VISUAL EXAMINATION

INSERVICE HYDRAULIC SNUBBER EXAMINATION

- Snubbers with remote reservoirs may be held securely by reservoir tubing
- Snubbers may have flexible remote reservoir tubing
- Examine for tubing leakage or signs of leakage
- Adequate fluid levels
 - Reservoir level is with acceptable range based on its piston setting

INSERVICE REQUIREMENTS

- Verify proper orientation



INSERVICE HYDRAULIC SNUBBER EXAMINATION

- Some weepage may be acceptable
- Leakage collection system
- Check for loose tubing connections
- Worn primary seals or wipers

INSERVICE REQUIREMENTS

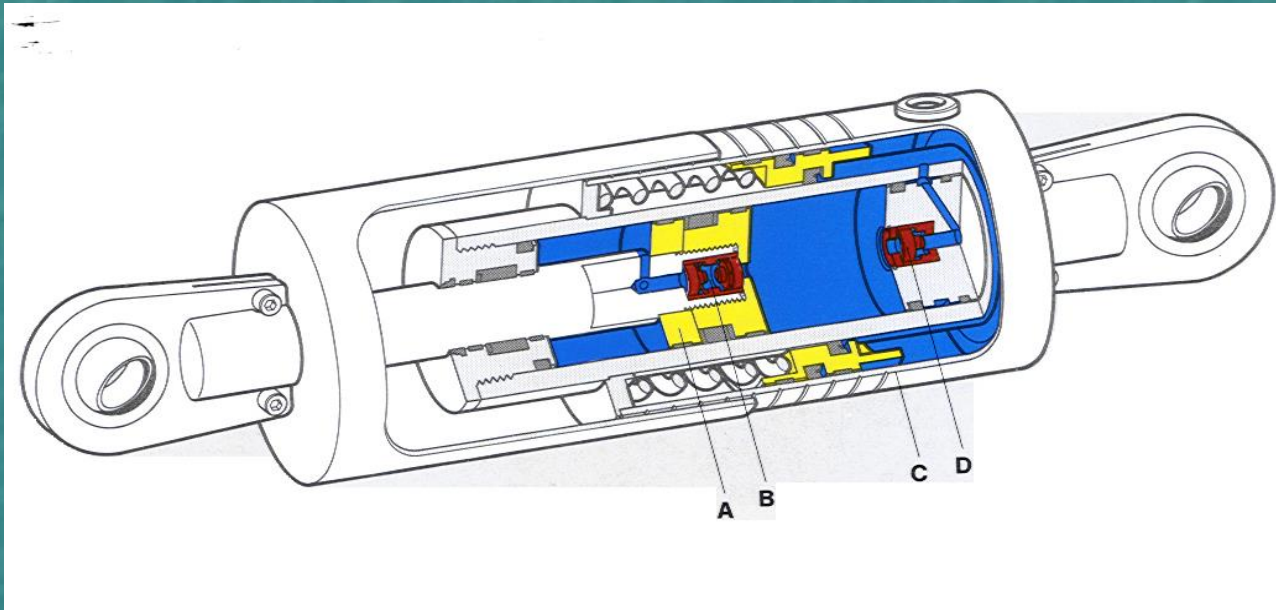
- Reservoir Level verification



INSERVICE HYDRAULIC SNUBBER EXAMINATION

- Snubbers equipped with a vented reservoir
 - Verify that the vent port inside the reservoir is at the proper orientation
 - Shipping plug has been removed
 - Adequate fluid level based on piston setting position

Hydraulic Snubber Internal Reservoir



HYDRAULIC SNUBBER EXAMINATION WITH INTERNAL RESERVOIR

- Reservoir is self contained
 - May have a fluid level indicator – brass sleeve
 - May require measuring rods to verify adequate fluid levels
 - Leakage may be seen coming out from the indicator tube
 - Removal of the indicator tube or shroud may be necessary to validate source of leakage

VISUAL EXAMINATION OF SNUBBERS

Questions?

KPI reports

What are your feelings about KPIs?

Supposedly SNUG owns the KPI (senior manager told us this). INPO started, but we own. Did you know this?

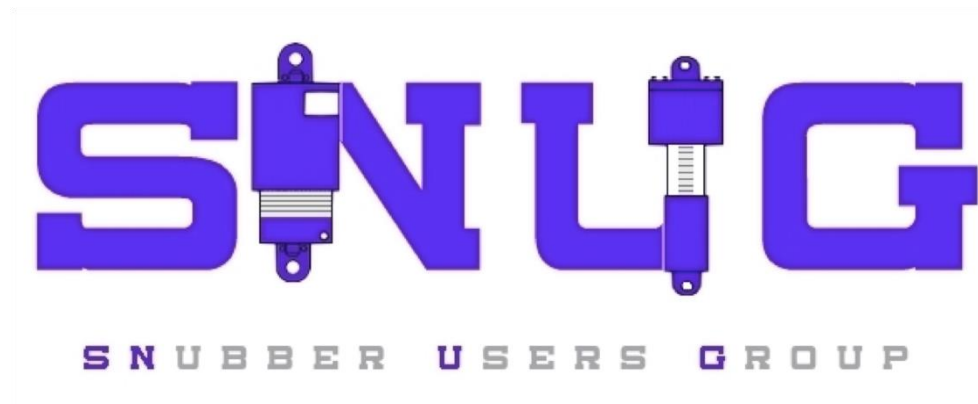
Does anyone look at yours unless it is **RED**? TVA no one looks at snubber and even INPO doesn't ask for them when they come in.

What color is yours typically? TVA all seven units are routinely **Green**. Might have one indicator that is a different Color, but overall is Green.

What is the opinion of the group? Does the KPI do anything or is it just busy work? Do we suggest maybe getting rid If possible?

AFTERNOON BEVERAGE BREAK

SPONSORED BY



RETURN BY 3:00 PM



Join at menti.com | use code 8517 5490

Mentimeter

Snubber Mythbusters

SNUG Summer 2026



menti.com
8517 5490



Rebuilding LISEGA Snubbers

July 2026
Abby Hainsworth – PSEG Snubber Engineer



PSEG Nuclear Snubber Programs

Safety Related Population is 100% Lisega Hydraulic Snubbers

Hope Creek Unit 1 (BWR)

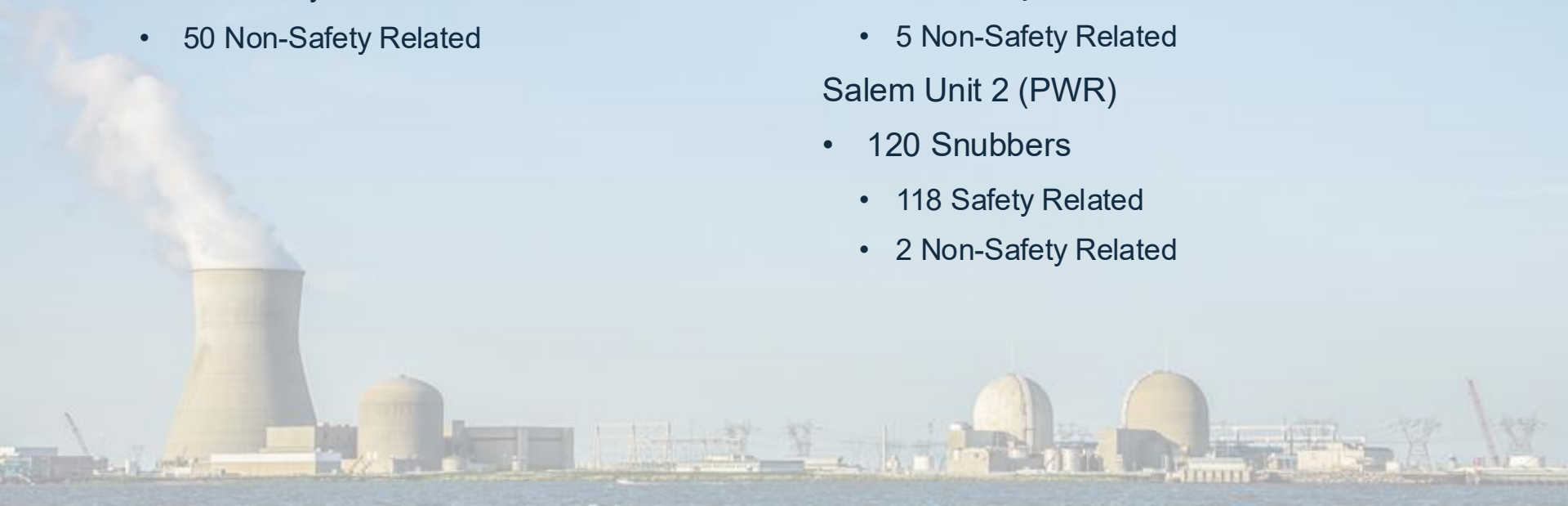
- 639 Snubbers
 - 589 Safety Related
 - 50 Non-Safety Related

Salem Unit 1 (PWR)

- 125 Snubbers
 - 120 Safety Related
 - 5 Non-Safety Related

Salem Unit 2 (PWR)

- 120 Snubbers
 - 118 Safety Related
 - 2 Non-Safety Related



Snubber Maintenance

- PSEG has a 'Snubber Shop' within Hope Creek Unit 2 Turbine Building
 - Utilized for both stations
 - Used for storage, rebuilding, and testing of snubbers
- Rebuilds performed by in-house maintenance personnel
 - Trained by PSEG training department and Vendor
- PSEG owns Barker/Diacon S2000NM Test Bench System
 - Utilize vendor for snubber testing
 - Currently training in-house maintenance for snubber testing as well (trained by vendor)



Process

- Snubber Rebuilds generally begin 3-5 months prior to an RFO
- In-house maintenance performs rebuilds with PSEG Procedures
 - Procedure includes steps to notify snubber engineer if any discrepancies are found during rebuild such as degraded seals, dark fluid, etc.
- Maintenance provides snubber engineer with a copy of the completed procedure to review for each snubber
 - Program manager documents their rebuild notes and the snubber rebuild date
 - Information is reviewed for service life monitoring purposes

4.2.4. **IF** brass piston is visible,
THEN STOP and **NOTIFY** Snubber Engineer for inspection;
OTHERWISE MARK step 4.2.4 with NA and **GO TO** step 4.2.5.

Individual Notified Abby Heinsohn Date 9/23/18

4. **NOTIFY** Snubber Program Owner to identify degraded conditions found during rebuilding process. Items would include, Galled threads, dirty oil, low oil, or any deficiency affecting performance. Notifications are to be added to the corrective action program to track and trend snubber issues.

SAT ☐ UNSAT ☒ (add comments)

Comments: Fluid was dark and dirty
Engineer notified. Permission to continue granted
B 9/23/18
 Mechanic/Date

Challenges

- Relying on testing vendor
 - Testing vendor is brought on site ~2-4 weeks prior to outage to test all rebuilds prior to installation
 - If any rebuilds fail, this leaves minimal time for rebuilding failures
- Snubber rebuilds are considered low priority when emergent work arises
 - Decreasing number of qualified technicians as folks retire, etc.
- Parts availability / Storage
 - Occasional long lead time of rebuild kits
 - Must consider shelf life of hydraulic oil
 - Emergent need to order new snubbers when rebuilt snubbers fail



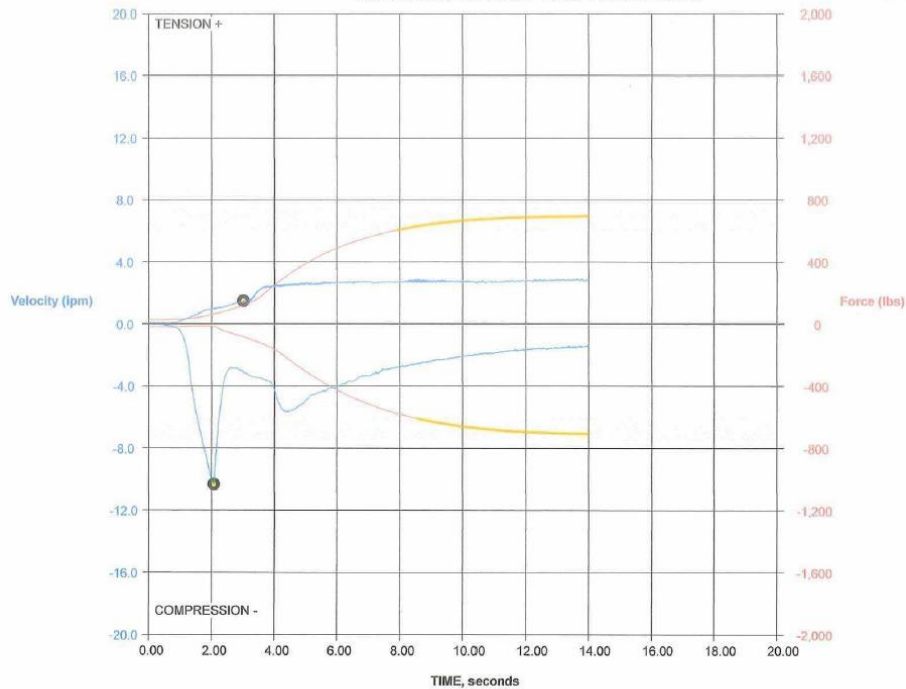
3018s

- Historically, we rebuild 3018s in house
- During S2R28 functional test campaign (Spring 2026), 3 Lisega 3018 snubbers failed their functional test
 - Created failure mode group for Lisega 3018s installed in Salem Unit 2.
 - Tested all 20 installed 3018s.
- All 3 failures were previously installed in Hope Creek, then rebuilt by PSEG.
- All 3 snubbers failed the same way (locked up).
- Currently pending failure analysis. (Est. completion Fall 2026).
- Until failure analysis is complete, we will only be installing new 3018s.
 - Adequate spares in stock to replace all S1 3018s with new in Fall RFO if required



AS FOUND LOCKUP AND BLEED TEST

MM 4/14

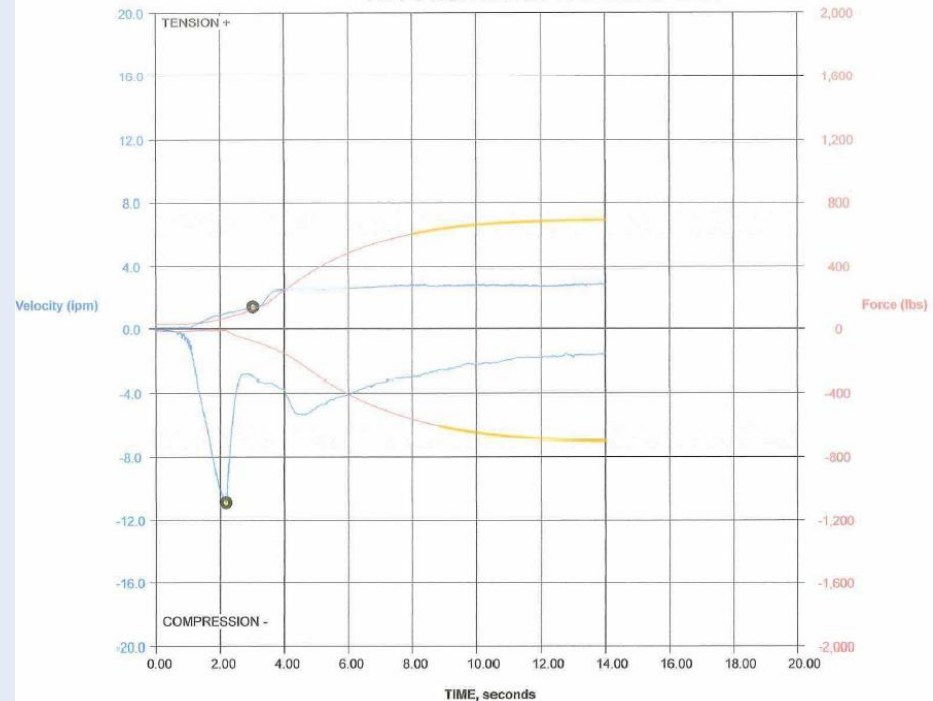


PARAMETER	MIN/MAX	TENSION	COMPRESSION
Lockup Rate (ipm)	4.72/14.17	1.50*	-10.32
Bleed Rate (ipm)	0.47/4.72	2.78	-1.84
Test Load (lb)	608/743	671	-676

* indicates need for evaluation

VA 80
FA 80
PA 0
PC 5

AS FOUND LOCKUP AND BLEED TEST



PARAMETER	MIN/MAX	TENSION	COMPRESSION
Lockup Rate (ipm)	4.72/14.17	1.40*	-10.90
Bleed Rate (ipm)	0.47/4.72	2.81	-1.95
Test Load (lb)	608/743	668	-672

* indicates need for evaluation

VA 80
FA 80
PA 0
PC 5

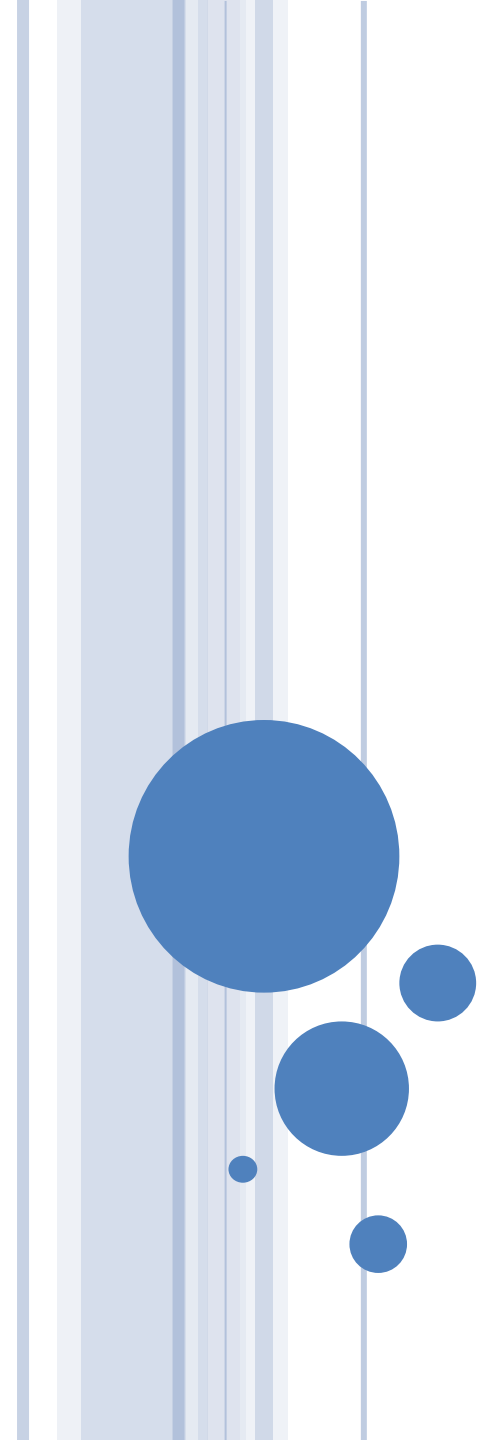
 Thank
you

Questions?

Abby Hainsworth
PSEG Nuclear
abby.hainsworth@pseg.com

QUESTION CARDS
OR QUESTIONS FROM THE
FLOOR
???





Business Meeting

SNUBBER USERS GROUP, INC. 2026 BUSINESS MEETING

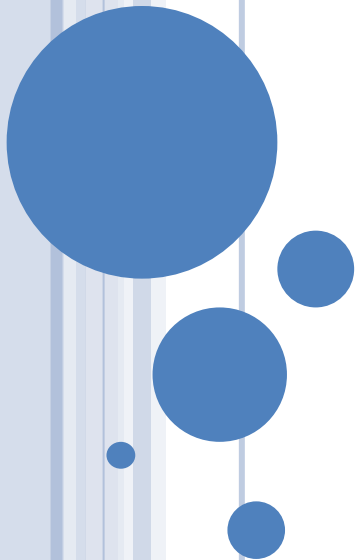
Scott Esposito

President & Chairman of the Board

Business Meeting

ROLL CALL

SUMMER 2026



CURRENT ACTIVE MEMBER PLANTS

- Arkansas Nuclear One
- Beaver Valley
- Braidwood
- Browns Ferry
- Brunswick
- Byron
- Callaway
- Calvert Cliffs
- Catawba
- Clinton
- Columbia
- Comanche Peak
- Cook
- Cooper
- Davis-Besse
- Diablo Canyon
- Dresden
- Farley
- Fermi
- FitzPatrick
- Ginna
- Grand Gulf
- Harris
- Hatch
- Hope Creek
- Krsko
- LaSalle
- Limerick
- McGuire
- Millstone
- Monticello
- Nine Mile
- North Anna
- Oconee
- Palo Verde
- Peach Bottom
- Perry
- Point Beach
- Prairie Island
- Quad Cities
- River Bend
- Robinson
- Salem
- Seabrook
- Sequoyah
- South Texas
- St. Lucie
- Summer
- Susquehanna
- Vogtle
- Waterford
- Watts Bar
- Wolf Creek



Current SNUG Board of Directors

Terms	Open Slot
expiring	Scott Esposito
2026	Bob Fandetti
	Stephanie McCormick

Terms	Tim Canter
expiring	Jeff Stallman
2027	Nate Frank
	Steve Norman

Terms	Ed Dundon
expiring	Mitch Etten-Bohm
2028	AP Smith
	Serena O'Donnell





Business Meeting

INTRODUCTION OF NOMINEES

Scott Esposito

President & Chairman of the Board

2026 - 2029 Terms

SNUG Board of Directors Nominees

- **Scott Esposito**
- **Bob Fandetti**
- **Stephanie McCormick**

Up to four candidates may be voted for.

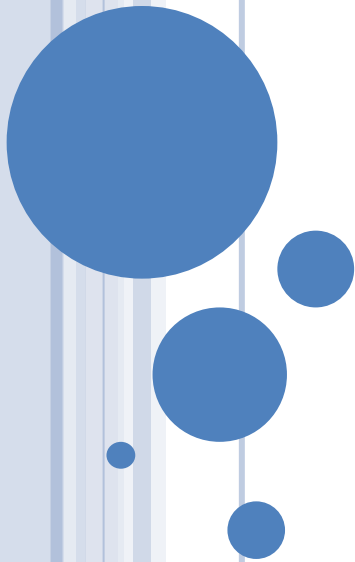
One ballot per member site.

Top four elected regardless of number of votes.



Business Meeting

ELECTION OF DIRECTORS





SNUGBBER USERS GROUP

Current Financial Status

Presented by Mitch Etten-Bohm
SNUG Treasurer & Chief Financial Officer
Summer 2026 Conference & Trade Show
July 13, 2026



Beginning January 1, 2026

Account Balances

• Checking Account	\$ 7,459.49
• Money Market Account	\$ 5,738.40

Total	\$ 13,197.89
--------------	---------------------

Year to Date Income

CATEGORY	EXPECTED	ACTUAL
2026 Membership Fees	\$ 41,000.00	\$ 19,800.00
2025 Membership Fees	\$ 8,400.00	\$ 7,200.00
Interest Earned	\$ 0.00	\$ 0.40
Total	\$ 41,000.00	\$ 27,000.40

Current Status (through June 22nd)

Beginning Balance 1/1/2026	\$ 13,197.89
----------------------------	--------------

Expenditures	\$ 8081.47
--------------	------------

Income	\$ 27,000.40
--------	--------------

Current Total	\$ 32,116.82
---------------	--------------

CURRENT ACTIVE MEMBER PLANTS

- Arkansas Nuclear One
- **Beaver Valley**
- Braidwood
- Browns Ferry
- Brunswick
- Byron
- Callaway
- Calvert Cliffs
- Catawba
- Clinton
- Columbia
- **Comanche Peak**
- Cook
- Cooper
- **Davis-Besse**
- Diablo Canyon
- Dresden
- Farley
- Fermi
- FitzPatrick
- Ginna
- Grand Gulf
- Harris
- Hatch
- Hope Creek
- Krsko
- LaSalle
- Limerick
- McGuire
- Millstone
- Monticello
- Nine Mile
- North Anna
- Oconee
- Palo Verde
- Peach Bottom
- **Perry**
- Point Beach
- Prairie Island
- Quad Cities
- River Bend
- Robinson
- Salem
- Seabrook
- Sequoyah
- **South Texas**
- **St. Lucie**
- Summer
- **Susquehanna**
- Vogtle
- Waterford
- Watts Bar
- Wolf Creek

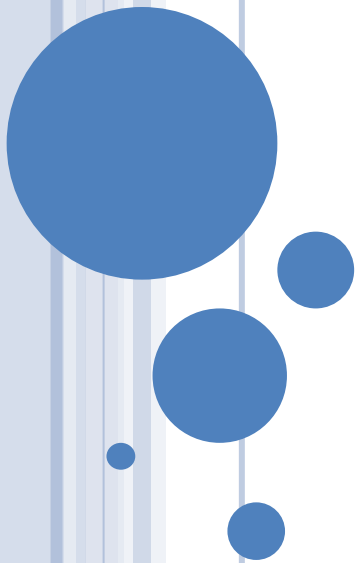


SNUBBER USERS GROUP
Current Financial Status



Business Meeting

ELECTION RESULTS



Business Meeting

ELECTION RESULTS

Your New Directors for 2026 – 2029 are:

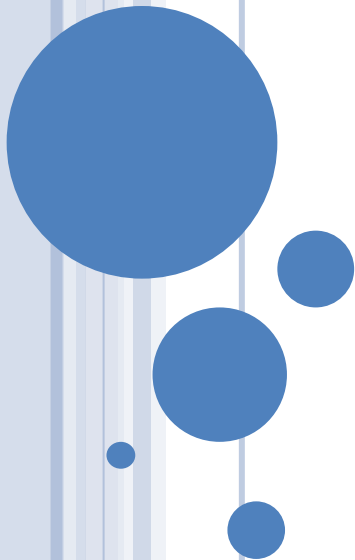
- **Scott Esposito**
- **Bob Fandetti**
- **Stephanie McCormick**

Business Meeting

**ADJOURN
SNUBBER USERS GROUP, INC.
2026 BUSINESS MEETING**

Scott Esposito

President & Chairman of the Board



DAILY ADJOURNMENT

BUSES LEAVE FOR TOWNBALL TAVERN & GOOSE ISLAND
PUB AT TARGET FIELD AT
4:50 PM

DON'T BE LATE

TUESDAY'S SESSION BEGINS AT
8:00 AM

