



EUCI Presents a Course on:

NUCLEAR POWER FUNDAMENTALS

February 4-5, 2010 • Intercontinental Hotel • New Orleans, Louisiana

"The Nuclear Power Fundamentals course solidified my knowledge of the nuclear power plant and the nuclear power industry. Everybody in the nuclear business should attend this course."

Engineering Configuration Control Manager, Mitsubishi Nuclear Energy Systems

"Well structured and very informative course on most aspects of nuclear power. Must do for anyone coming into the industry."

Mechatronic Project Engineer, ANSTO

"Extensive information and comprehensive summary of basic knowledge of the nuclear power industry."

International Product Manager, HALFEN GmbH

"I would recommend an EUCI conference to anyone in the nuclear industry!"

Research Analyst, Ux Consulting

"As a non-technical person in the nuclear industry, with less than one year at my current position, I found the speaker and material to be very effective and informative. I walked away with relevant knowledge I did not have before attending the course."

Administrator, INPO



EUCI is authorized by IACET to offer 1.0 CEUs for this program.

NUCLEAR POWER FUNDAMENTALS

February 4-5, 2010

OVERVIEW

Nuclear Power Fundamentals is the vital course for those who are entering or working in the rejuvenated nuclear power industry. Nuclear power is having a renaissance due to a confluence of factors including global warming, the cost and supply reliability of oil, issues involving coal and greenhouse gases, and the safety record and superb operational performance of nuclear units. Those factors and the improved political climate have resulted in many utilities filing applications for combined construction and operating licenses for new nuclear power plants. Understanding the technology and operations of a nuclear facility can assist employees and service providers, such as vendors, attorneys, and contractors, in comprehending the nuclear energy system.

This course will review the status of nuclear power in the US and throughout the world. It addresses the events and forces that have influenced, and continue to influence, commercial nuclear power. Participants will understand how we got to where we are today, including the reasons for the long period of dormancy in the nuclear power industry. Significant industry events will be discussed including Three Mile Island and Chernobyl. Pressurized and boiling water reactor systems will be reviewed. The changes in both the political and environmental landscapes and the Energy Policy Act of 2005 which are all critical to the nuclear renaissance will be addressed. Additional topics include the nuclear fuel cycle, the uranium enrichment and reprocessing controversies, radioactive wastes including spent nuclear fuel storage, spent fuel transportation, and the Nuclear Regulatory Commission's set of performance indicators demonstrating excellent operations. Lastly, to better understand how reactors generate power we will explore the nuclear force and binding energies and fissile vs. fertile nuclear materials. This course will help personnel involved in the nuclear energy industry to have a clear understanding of nuclear power and the challenges of tomorrow.

TOPICS INCLUDE

- Issues concerning the resurgence of nuclear energy
- The history of nuclear power and its development
- Nuclear events that impacted the nuclear industry
- Energy Policy Act of 2005
- The Global Nuclear Energy Partnership (GNEP)
- Designs and functions of PWRs and BWRs
- Generation III and IV reactor designs
- Nuclear power and the environment
- The nuclear fuel cycle and some nuclear physics
- The future for nuclear power

WHO SHOULD ATTEND

- All new employees whose job requires a working knowledge of nuclear power
- Personnel in the energy industry that are newly assigned to nuclear generation
- Employees who need a job-related understanding of the history, structure, purpose, and application of nuclear power
- Public affairs and public relations personnel who need an understanding of nuclear energy
- Executives and managers who require general instruction in nuclear power including nuclear plant designs, construction, operations, regulatory reporting, radiation protection, the nuclear fuel cycle, and industry history
- Managers and engineers with new responsibilities in nuclear power
- Suppliers and vendors involved in the procurement cycle for new and existing nuclear plants
- Attorneys and paralegals whose work is directly or indirectly involved with nuclear energy

IACET



EUCI has been approved as an

Authorized Provider by the International Association for Continuing Education and Training (IACET), 1760 Old Meadow Road, Suite 500, McLean, VA 22102. In obtaining this approval, EUCI has demonstrated that it complies with the ANSI/IACET Standards which are widely recognized as standards of good practice internationally.

As a result of their Authorized Provider membership status, EUCI is authorized to offer IACET CEUs for its programs that qualify under the ANSI/IACET Standards.

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Requirements for Successful Completion of Program

Participants must sign in/out each day and be in attendance for the entirety of the course to be eligible for continuing education credit.

Instructional Methods

PowerPoint Presentations will be used in this course

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LEARNING OBJECTIVES

- Review the historical events, technical issues, and industry challenges that have shaped the nuclear power industry to where it is today
- Describe why the nuclear power industry has been dormant for the past 20 years
- Examine the impact of the confluence of global warming and energy security on the future of nuclear power
- Discuss the pivotal topics critical to the nuclear power renaissance
- Identify factors impacting the nuclear power industry today, including the changing political and environmental perspectives on nuclear power
- List which utilities have applied for combined construction and operating licenses and where those proposed new plants will be located
- Recognize the safety standards required by CNSC and the NRC and the safety culture transformation of the industry that was heavily influenced by TMI
- Analyze the changes in the nuclear power regulatory environment that are important to the success of the nuclear power renaissance
- Demonstrate a technical understanding of the pressurized water reactor and boiling water reactor technologies
- Examine the safety performance record of the nuclear power industry
- Identify and discuss the components that make up the nuclear fuel cycle
- Recognize the critical issues of enrichment, radioactive wastes, spent nuclear fuel transportation, and proliferation concerns
- Review the basic concepts of nuclear physics to better understand the power behind nuclear power

INSTRUCTOR

Howard L. Sobel has been involved in the nuclear power industry for more than 35 years. He worked for American Electric Power Service Corporation where he was Assistant Division Manager of Nuclear Engineering, responsible for all company activities related to the safety and licensing of the company's DC Cook Nuclear Plant, as well as the supply and performance of its nuclear fuel. Howard is the principal of his own firm working with attorneys on complex issues involving nuclear power plants and other nuclear and non-nuclear facilities, including the national labs concerning their operations and often testifies in different jurisdictional venues on those issues. Mr. Sobel has made presentations to the Nuclear Regulatory Commission and the Advisory Committee on Reactor Safeguards. Projects he has spearheaded include working with Minatom of Russia and the Russian Federation Navy on the safe storage, transportation, and management of spent nuclear fuel from decommissioned Russian nuclear submarines and as Chairman of the Independent Review Committee at the Savannah River Lab of the US DOE reviewing their management of toxic, hazardous, and nuclear wastes. He is a licensed Professional Engineer in New York and North Carolina, an Honorary Lifetime Member of the American Nuclear Society, and on the Panel of Arbitrators of the American Arbitration Association. Howard has authored courses and conducted seminars for continuing education credits for Licensed Professional Engineers and Registered Architects. Mr. Sobel earned a Bachelor of Science degree in Engineering Physics from Cornell University and a Master of Science in Nuclear Engineering from the University of Michigan.

NUCLEAR POWER FUNDAMENTALS

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PROGRAM AGENDA

THURSDAY, FEBRUARY 4, 2010

7:30 – 8:00 a.m.

Registration and Continental Breakfast

8:00 – 10:00 a.m.

Welcome and Program Overview

The Nuclear Power Renaissance

- The Confluence of Factors Creating the Renaissance
 - Rising and Volatile Gas and Oil Prices
 - Foreign Dependence on Fuels
 - Unknown Future Mandated CO2 Regulation
 - Climate Change Concerns
 - Energy Independence
 - Environmentalists Changing Perception of Nuclear Power
 - Excellent Safety Record of Nuclear Power
 - Changes in the Licensing and Regulatory Climates
 - More Receptive Public and Political Support
 - Incentives in the Energy Policy Act of 2005
- The Obstacles to the Renaissance
 - Unresolved Challenges of High Level Wastes (Used Nuclear Fuel)
 - Potential Security Risks from Proliferation
 - Perceived Adverse Safety, Environmental, and Health Effects
 - High Relative Costs
 - Sufficient Engineering Personnel to Design and Operate Plants
 - Sufficient Nuclear Component Manufacturing Capability
 - Alternatives Including Wind, Solar, Biomass, and Conservation
 - The Environmental and Anti-Nuclear Movements
 - Change in Administration in Washington, DC
- Potential Fatal Flaws that Could Impact the Renaissance
 - A Major Nuclear Power Plant Accident
 - A Terrorism Event at a Nuclear Power Plant
- The Fundamental Question

Electricity Consumption and Demand

- Standard of Living and its Correlation to Electricity Consumption
- Projected US Electricity Demand Growth
- US Electric Generating Capability
- US Generating Capability by Fuel Type
 - Coal, Nuclear, Gas, and Other
 - Most Recent Capability Addition by Fuel Type

Nuclear Power Status

- Worldwide – Current and Future
 - 439 Nuclear Power Reactors Worldwide
 - 34 Nuclear Plants Under Construction
 - China, India, and Russia Have Plans
 - Nuclear Plants in the Oil Rich Middle East
- US – Current and Future
 - The Aging Nuclear Fleet
 - 17 Companies Submit Applications for 26 New Plants

Nuclear Power Plants in the US

- Different Plants in Different States
 - 104 Reactors at 64 Sites in 31 States
 - Why Are They So Different?
- The DC Cook Nuclear Power Plant in Michigan
 - A Complex Maze of Steel and Concrete

Nuclear Power History – What to Learn From the Past

- The Nuclear Power Timeline
- $E = mc^2$
- Nuclear Weapons
 - Too Many in Too Many Places

10:00 – 10:15 a.m.

Morning Break

10:15 a.m. – 12:00 p.m.

- Nuclear Power Goes Dormant
 - 97 Power Reactors Cancelled – Why?
- The Early Nuclear Power Plants
 - Dresden, Oyster Creek Built in ~ 4 Years
- The Rush to Build in the 1960-1970s
 - 168 Units Announced
- The Clean Air Act of 1970
- The Arab Oil Embargo of 1973
- Natural Gas Restrictions
- The Industry Responds
 - Reactor Vendors Scale Up Their Designs
- The Nuclear Regulator Changes
 - No Longer the Promoter of Nuclear Power
- The Browns Ferry Fire
 - Changes Continued for More Than 10 Years
 - Cable Separation, Alternate Shutdown, Appendix R
- Three Mile Island and Its Impact
 - Equipment and Operator/Human Errors
 - Massive Changes Impacting Equipment, Training, and Culture
 - Human Performance, Emergency Preparedness, INPO
- Other Industry Events
 - Seismic Design, Marble Hill, Midland, Zimmer
- The NRC Changes
 - Meticulous Compliance, Safety Conservatism, SALP
- The Challenges Faced by the Nuclear Industry
 - The Changing Regulatory Environment
 - Anti-Nuclear and Environmental Movements
- Shoreham – The Poster Child for the Anti-Nuclear Movement
 - Delays, Mistakes, and Timing
 - Calvert Cliffs, TMI
 - 20 Years from \$70 Million to \$3.2 Billion

12:00 – 1:00 p.m.

Group Luncheon

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PROGRAM AGENDA

THURSDAY, FEBRUARY 4, 2010 (CONTINUED)

1:00 – 2:30 p.m.

- Chernobyl
 - Human Error, Fundamental Design Flaws
- The Raising Standard/The New Culture
 - Excellence Becomes a Moving Target
 - Safety Trumps Cost
 - A Safe Plant is an Economic Plant
 - Corrective Action Must be Prompt, Complete, and Effective
 - Prudence and Reasonableness by Themselves is Not Acceptable
- The Nuclear Industry Retreats
 - Nuclear Plants Become a Resource Draining Burden
 - The Public, Press, and Politicians Are Against Nuclear Power
 - Operating Events and Licensee Errors Result in Fines
 - Wall Street Becomes Disenchanted
 - The NRC is a Hardened Regulator
 - The Industry Could Not Respond Effectively nor Convincingly

The Nuclear Industry Changes its Methods and Means

- The Nuclear Industry Consolidates – Plants for Sale
 - Most Single Unit Plants Get Sold
- Operating License Extensions
 - More Than Half of the Plants Add 20 Years to Their License
- Capacity Factor Improvements
 - Capacity Factors Go From 65% to Over 90%
- Plant Updates
 - Design Margins Translate Into More Megawatts
- Regulatory and Licensing Changes
 - 1992 NRC Changes
 - Two-Step Licensing to One-Step Licensing – The COL
 - NP 2010
 - The Industry Tests the COL Process
 - Early Site Permits
 - Bank the Site for 20 Years
 - Design Certifications
 - Bank the Design for 15 Years
 - The AP1000, ESBWR, USEPR, and APWR – Generation III
 - Energy Policy Act of 2005
 - Price Anderson
 - Standby Support – Construction/Licensing Delay Insurance
 - Production Tax Credits
 - Loan Guarantees
 - Global Nuclear Energy Partnership – GNEP
 - Advanced Recycling of Nuclear Fuel
 - Energy Security While Reducing Proliferation

Pressurized Water Reactors

- Design
 - Defense in Depth
- Reactor Coolant System
- Reactor Pressure Vessel
- Steam Generator
- Nuclear Fuel and Fuel Handling

2:30 – 2:45 p.m.

Afternoon Break

2:45 – 5:00 p.m.

Boiling Water Reactors

- Design
- Reactor Pressure Vessel
- Nuclear Fuel and Refueling

Generation III and Generation IV Designs

- Generation III
 - Evolutionary Improvements
 - Passive Safety Systems
- Generation IV
 - Enhanced Safety
 - Minimal Waste Generation
 - Proliferation Resistant
 - Highly Economic

Nuclear Power and the Environment

- Greenhouse Gases
- Carbon Dioxide
 - 50,000 Fossil Fired Power Plants Worldwide
 - 8,000 Fossil Fired Power Plants in the US
- Health Issues
 - An Acceptable Risk?
- Greenhouse Effect
 - This is Real
- Global Warming
 - Is This Real?
- Coal and Carbon Caps
 - Northeastern States Carbon Cap
 - Federal Caps and The New Administration in Washington, DC
 - A Significant Game Changer
- Carbon Capture
 - Will It Work and What Will It Cost?

Alternate Fuels and Power Sources

- Uranium/Natural Gas/Oil/Coal – Pros and Cons
- Energy Content Comparison
 - Nuclear Energy vs. Chemical Energy
- Hydro/Wind/Solar
 - Environmental Impacts

Environmental Issues

- 2007 Nobel Peace Prize
- Some Environmentalists Change Their Tone Towards Nuclear Power
 - Climate Change vs. Nuclear Power – Choose Your Poison
- Kyoto Protocol
 - Greenhouse Gas Reduction

Costs and Economics

- Production Cost Comparison of Nuclear vs. Fossil Fired
- Fuel Costs Comparison of Nuclear vs. Fossil Fired
- Life Cycle Nuclear Power Costs
- Capital Cost Comparison of Nuclear vs. Fossil Fired

NRC Regulating the Nuclear Power Industry

- NRC Reactor Oversight Process
- NRC Performance Indicators
 - The Seven Safety Performance Indicators

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PROGRAM AGENDA

FRIDAY, FEBRUARY 5, 2010

8:00 – 8:30 a.m.

Continental Breakfast

8:30 – 10:15 a.m.

The Nuclear Fuel Cycle

- Overview
- Uranium Ore
- Uranium Conversion
- Uranium Enrichment
 - Gaseous Diffusion
 - Gas Centrifuge
 - Non-Proliferation Treaty
 - Megatons-to-Megawatts Program
- Fuel Fabrication
- Nuclear Fuel Costs

Some Nuclear Physics

- The Nuclear Force
- Mass Defect
- Fission versus Fusion
- Fusion Reaction
- Fission Reaction
- Binding Energy
- Fission Energy
- Radioactivity
- Half-Life

10:15 – 10:30 a.m.

Morning Break

10:30 a.m. – 12:00 p.m.

Radioactive Waste

- Low Level Radioactive Waste
- As Low As Reasonably Achievable
- High Level Radioactive Waste
- Used Nuclear Fuel Storage

The Back End of the Nuclear Fuel Cycle

- Reprocessing
 - US – No; Rest of the World – Yes; Why?
- Yucca Mountain
 - The Nuclear Waste Fund
- Used Nuclear Fuel Storage in the US
- Used Nuclear Fuel Transportation
 - A 40 Year Record of Safety
- Used Nuclear Fuel Cask Design
 - Certification Requirements for Used Nuclear Fuel Casks
- Dry Storage
 - Independent Spent Fuel Storage Installations
- Used Nuclear Fuel Cask Testing
- Requirements for Shipping Low Level Radioactive Waste

The Future for Nuclear Power

- The Political Environment – A New President
- The New Licensing Approach – COL
- Rebuilding the Nuclear Industry Infrastructure
- Favorable State PUC Actions
- The Oil Addiction, Energy Security, and National Security
- Hybrid and Electric Cars
- Will Utilities Commit?

Closing and Open Forum for Questions

PROCEEDINGS

The proceedings of the course will be published and one copy will be distributed to each registrant at the course.

COURSE LOCATION

A room block has been reserved at the Intercontinental Hotel – New Orleans, 444 St. Charles Ave, New Orleans, Louisiana, for the nights of February 3-4, 2010. Room rates are US \$159 single/double guest rooms. Call 504-585-4346 for reservations and mention the EUCI conference to get the group rate. Make your reservations prior to January 13, 2010. There are a limited number of rooms available at the conference rate. Please make your reservations early.

REGISTRATION INFORMATION

REMEMBER, EVERY 4TH REGISTRANT IS FREE

For instant registration, call (303) 770.8800 or fax the Registration Form to (303) 741.0849.

Register 3, Send 4th Free!!

Any organization wishing to send multiple attendees to this course may send 1 FREE for every 3 delegates registered. Please note that all registrations must be made at the same time to qualify.

All cancellations received on or before December 31, 2009 will be subject to a \$195 processing fee. Written cancellations received after this date will create a credit of the tuition (less processing fee) good toward any other EUCI conference or publication. This credit will be good for six months. In case of conference cancellation, Electric Utility Consultants' liability is limited to refund of the conference registration fee only. For more information regarding administrative policies such as complaints and refunds, please contact our offices at (303) 770.8800.

EUCI reserves the right to alter this program without prior notice.

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PLEASE REGISTER THE FOLLOWING

- Nuclear Power Fundamentals, February 4-5, 2010, \$1395
Early Bird on or Before January 22, 2010, \$1195

ENERGIZE WEEKLY

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- Sign me up for "Energize Weekly"

How did you hear about this event?
(Direct email, Colleague, Speaker(s), etc.)

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