



EUCI Presents a Course on:

ANALYTIC METHODS FOR SOLVING ASSET MANAGEMENT DECISION PROBLEMS

MANAGING AGING INFRASTRUCTURE, REPAIR/REPLACE POLICY; SPARES
VALUATION, PROJECT VALUATION AND PORTFOLIO MANAGEMENT

October 28-29, 2009

• Hyatt Regency Vancouver

• Vancouver, BC



EUCI is authorized
by IACET to offer 1.4
CEUs for this program.

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OVERVIEW

This is a workshop about asset management problems and how to solve them practically, using actual, proven methods that provide answers to real problems.

There are several things that this workshop is not. It is not about process or how you should reorganize. It is not about applying "standards" to solve the asset management problem. And, it is not a seminar where "experts" expound on theory.

This seminar is different. In this seminar the focus is on the methods themselves. The purpose is to teach managers how to use the methods to solve problems. This seminar can be thought of as engineering-and practice-oriented as opposed to management-and business-oriented. The instructors have developed the methods and have applied them successfully in many applications. They want to teach others how to use what they have created because they know how valuable their methods are. They also know that existing practice includes the use of methods that ought to be replaced.

The objectives of this workshop include both teaching new ways to think about asset management problems (which is needed because the current thinking is wrong in some fundamental ways) and teaching the technical aspects of appropriate methods.

This workshop will focus on three asset management problems – (1) Managing Aging Infrastructure, (2) the related problem of Equipment Spares Valuation, and (3) Project Valuation and Project Portfolio Management.

For managing existing infrastructure, the basic question is very simple: What to do with an existing piece of equipment - repair, replace, do nothing? The fact that there is risk is what makes the aging asset problem tricky.

The instructors and their associates have arguably done more technical development work in this area than any other organizations working on electric utility aging asset problems, with particular attention to creating methods that handle the problem of risk. They will use their experience and the concepts and tools they have developed to demonstrate how to solve actual repair/replace problems.

The spares valuation question is solved as part of creating a coherent asset management strategy. The methods for spares valuation fit naturally within and complement the methodology for managing the aging infrastructure. The key idea in spares valuation is how much risk a spare removes.

The trick in project valuation and project portfolio management is to measure the real world changes that projects create and to translate these changes into measures of value to the organization or corporation. This requires building a value model for the organization. Building value models is not terribly time consuming but requires special skills – working together, the instructors have developed value models for more than 20 electric utilities and will demonstrate project valuation and portfolio management by working with the participants to teach the basics of how to build value models.

Attendees will learn the key elements for solving these three asset management problems. They will come away equipped to organize the analysis within their organizations. They will understand the analytic tool requirements and appreciate the data issues. They will be in a position to lead effectively their organization's efforts to address these critical issues.

WHO SHOULD ATTEND

The intended audience includes asset managers, project managers, engineers, and even executives who appreciate the need for better methods.

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.

EUCI is authorized by IACET to offer 1.4 CEUs for this course.

Instructional Methods

Case Studies and PowerPoint Presentations will be used in this course.

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.

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LEARNING OBJECTIVES

Attendees will review and discuss in this seminar:

- New ways to think about the three fundamental asset management problems—[1] how to create the optimal replace/repair/test policy for aging assets, [2] how to find the value of spares and determine when and where to place spares in the system, and [3] how to prioritize aging assets projects using project valuation so that spending is optimized.
- How to analyze and manage the risks associated with these three fundamental problems
- What each of these problems require in terms of data, analytical methods, decision support software, internal analytical skills, and organizational support
- How to structure data requirements and avoid wasted, expensive efforts
- How to choose tools to solve these asset management problems
- How to organize to solve asset management problems, and what organizational traps to avoid

INSTRUCTORS

Stephen Chapel manages **S.Chapel Associates** a private consulting firm that specializes in utility planning and asset management. Chapel has more than 20 years experience in electric utility planning and asset management including engineering-economic decision making, financial valuation, and capital budgeting. His current focus is on transmission and distribution business planning and asset management. From 1980 through mid 2003 he was a senior project manager with the Electric Power Research Institute. Before joining EPRI, Mr. Chapel spent four years with the Rand Corporation as a senior economist. While there, he carried out research on economic, financial and institutional issues associated with the development of advanced technologies. Previously, Mr. Chapel was the Deputy Director for the Department of Energy's Office of Economic Impact. From 1968 to 1974, he worked for the Office of Systems Analysis in the Department of Defense.

Mr. Chapel has managed many highly successful projects for the Utility industry. He has expert knowledge of the utility business analysis methods combined with proven problem solving and analytical capabilities. He is well known for his ability to take projects from the conceptual stage to a practical implementation that has aided numerous utilities make better investment and operational decisions. Besides several journal articles and white papers he is also a co-author (with Mukund Thapa) of a soon to be published book on programming using C and C++ Pointers.

Mr. Chapel received a B.S. degree in Statistics (1966) and an M.S. degree in Economics (1968) from the University of Wyoming.

Dr. Charles D. Feinstein is **Associate Professor of Operations and Management Information Systems** at the **Leavey School of Business, Santa Clara University**. Dr. Feinstein is cofounder of VMN Group LLC, a quantitative consulting company. He also teaches in the Department of Management Science and Engineering at Stanford University and in the Department of Industrial Engineering and Operations Research at the University of California, Berkeley. Dr. Feinstein has over 25 years of experience in research, teaching and application of mathematical methods and modeling. His areas of expertise include optimization, decision analysis, system dynamics, and systems analysis. His previous employment includes positions as a Senior Decision Analyst at Applied Decision Analysis, Inc. and as a Research Engineer at Xerox Palo Alto Research Center. He has been active in the academic and professional communities and has published more than forty technical papers and reports as well as presented many lectures on both theoretical and applied research. His current interests include investment planning and risk analysis in the electric power industry. He has written and presented extensively on managing aging infrastructure, project prioritization methodologies, distribution system risk analysis, and the application of distributed resources to distribution planning.

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PROGRAM AGENDA

WEDNESDAY, OCTOBER 28, 2009

Registration and Continental Breakfast: 8:00 – 8:30 a.m.

Course Timing: 8:30 a.m. – 5:00 p.m.

Group Luncheon: 12:00 – 1:00 p.m.

THURSDAY, OCTOBER 29, 2009

Continental Breakfast: 8:00 – 8:30 a.m.

Course Timing: 8:30 a.m. – 5:00 p.m.

Group Luncheon: 12:00 – 1:00 p.m.

MANAGING AGING ASSETS

1. Introduction to Managing Aging Assets

- Problem statement
- Solutions to the problem
 - Specification of the objective
 - Proper problem formulation
 - Technology—software, databases, expert judgment

2. Structure of Asset Management Methodology

- Objective: develop least cost strategy for replacement/repair/testing aging assets, including a forecast of asset behavior and costs. Develop high-value testing strategy—when to test and what to do based on test outcomes.
- Methodology components
 - Asset condition dynamics—how assets age
 - Condition-dependent hazard rates—how assets fail
 - Asset testing—how asset condition is learned
 - Policy optimization—how least-cost strategy is found
- Inputs to methodology
 - Cost and performance data
 - Condition dynamics data
 - Hazard data
 - Role of expert judgment—formal procedures
- Structure of methodology
 - Interplay of condition dynamics, uncertainty, condition inference, and optimization
 - Output reports. Policy specification

3. Analytic Tools—Case Studies in Asset Management

- Defining asset condition states. Specifying asset condition dynamics
- Estimating condition-dependent hazard rates
- Estimating test accuracy. Relationship of test outcomes to condition definitions. Inferring condition states from test outcomes
- Policy specifications. Comparing the optimal policy to any other policy
- Specific case study results—transformers, underground cable, wood poles, breakers, transmission lines.
- Discussion of case studies—what worked, what did not, what we learned, what we would change

4. Creating an Aging Assets Management Capability at a Utility

- Organizing for aging assets management
- Obtaining aging assets management tools

5. Summary & Conclusions

- What is the aging asset problem? Why is it important?
- What are the specific aging asset decisions that companies face?
- What are the useful analytic tools?
- What data is required to apply tools and make decisions?
- What are the organizational issues?

PROGRAM AGENDA (CONTINUED)

AGENDA – SPARES VALUATION METHODOLOGY

1. Introduction to Spare Valuation Methodology

- Problem statement. Where spares should be sited so that the lifecycle cost of managing an inventory of aging assets is minimized? How does the value of a spare vary by location in the system? How many spares should be acquired? Should existing spares be moved?
- How do spares add value to the inventory of aging assets?
 - Spares as risk-mitigation mechanism
 - Effect of multiple hazards—aging, common mode failure, dependent failures, arrivals (storms, extreme weather, terrorism, ...)
 - Effect of long replacement lead times—longer congestion interval, increased likelihood of multiple failures
 - Spares modify the probability distribution of the number of failed units at a location

2. Structure of Spare Valuation Methodology

- Level of analysis
 - Location, with multiple units, multiple transformer phases
 - Spares group—multiple locations that can share spares
 - Regional group—multiple spares groups that can share spares if common spec spares
- Outage distribution
 - Specified at location level. Hazard rates given by asset management methodology database
 - Sequential evaluation of the effect of multiple hazards
- Spare valuation
 - Spare modifies outage distribution over replacement lead time
 - Spare has location-specific value given the location outage distribution
 - Spare has group and regional value depending on cost consequences and likelihoods at other locations
 - Existing spares may be moved to achieve location benefits
- Data required for spares analysis. Review spares methodology database—costs, locations, ages, conditions, OEM, vintage, ... Role of expert judgment

3. Transmission Transformer Study—Some General Results

- A spare can provide value far in excess of its cost
- The primary asset may remain in service longer if a spare is present
- The value of a spare depends on where it is sited in the system
- The marginal value of additional spares decreases, which means that relatively few spares are required to achieve maximal risk reduction
- Even old spares have significant system value
- The value of a spare increases with the number of units it can cover
- The value of a spare increases as budgets decrease
- The value of a spare increases as replacement lead time increases
- A common-spec spare can provide considerable measurable benefits

4. Summary & Conclusions

- What is the spare valuation problem?
- What are the useful analytic tools?
- What data is required to apply tools and make decisions?
- What are the organizational issues?

PROJECT VALUATION AND PORTFOLIO MANAGEMENT

1. Introduction to Project Valuation and Portfolio Management

- Problem statement. The project valuation and portfolio management problem is that utilities do not know how best to allocate budget to competing projects.

In particular, project choice methods that are currently in use are not satisfactory because these methods are not transparent, consistent, uniform, repeatable, unbiased, responsive, analytic, value- and data-driven, and too often respond to political and personal power rather than the benefits that the project will provide.

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PROGRAM AGENDA (CONTINUED)

1. Introduction to Project Valuation and Portfolio Management *(continued)*

- Solutions to the problem
 - Organizational principles and specific tasks. What must occur in the utility for prioritization to be successful, regardless of valuation and portfolio method selected.
 - Methodology structure. What an appropriate methodology must be able to do in order for it to provide a good solution to the valuation and portfolio management problem.
 - Technology of prioritization. The need for software, for databases, for combining expert judgment with existing data
 - Value Functions. The fundamental importance of an analytic representation of the benefits projects provide.
 - Measurement of benefits and risks. How an appropriate methodology will compute benefits and risks provided by projects. How projects are combined into a portfolio.
- State of practice. What utilities are doing to prioritize projects

2. Analytic Tools for Valuation and Selection of Infrastructure Projects—First Principles

- Principles of project valuation
 - Mathematical methods for optimizing project portfolios using project value metrics. Mathematical programming formulation
 - Valuing projects and project portfolios. Deferral criterion.
 - Accounting for risk—what is the risk associated with a project and how does this impact project value?
 - The efficient frontier. Benefit/Cost analysis
- Principles of value modeling. How to create a value model for project prioritization
- Project description. Forecasting project performance
- Methodology structure

3. Analytic Tools for Project Valuation—Case Studies

- Description of case studies. How project valuation is done in practice.
 - Definition of project attributes
 - Creating a value function
 - Project reporting
 - Outputs and results
- Discussion of case studies. What worked, what did not, what was learned, what should be changed.
- Modeling issues. Examples. Discussion.

4. Creating a Project Portfolio Management Capability at a Firm

- Organizing for project portfolio management
- Obtaining project portfolio management tools

5. Summary & Conclusions

- What is the project prioritization problem?
- What are the specific prioritization decisions that companies face?
- What are the useful analytic tools?
- What data is required to apply tools and make decisions?
- What are the organizational issues?

PROCEEDINGS

The proceedings of the seminar 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 Hyatt Regency Vancouver, 655 Burrard St, Vancouver, BC V6C 2R7, for the nights of October 27-28, 2009. Room rates are \$189.00 CAD single or double occupancy, plus applicable tax. Call 604-683-1234 for reservations and mention the EUCI course to get the group rate. Make your reservations prior to October 5, 2009. There are a limited number of rooms available at the group 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.

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All cancellations received on or before September 25, 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 course 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 course registration fee only. For more information regarding administrative policies such as complaint 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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- Analytic Methods for Solving Asset Management Decision Problems, October 28-29, 2009, \$1495 + GST Tax (1569.75)
Early Bird on or Before October 16, 2009, \$1295 + GST Tax (\$1359.75)

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