

Introduction

Achieving energy savings should be seen as the responsibility of all staff. Well-trained operations and maintenance staff will be able to install appropriate systems and implement practices within the building's infrastructure, but daily use of the facilities is also important. Your communication plan (see the Communications Manual in this Guide) will engage municipal employees on a broad scale in the end-use savings opportunities. More detailed and ongoing training is recommended for facilities management and operations staff.

Engineering and technological products are continually improving to provide more energy-efficient performance in buildings and operations. Without appropriate training for those responsible for day-to-day operations, some of the valuable energy savings can be lost. Enhancing your staff's knowledge and skills related to energy-efficiency strategies and technologies will ensure that you continue to reap the maximum energy savings well beyond the involvement of your energy service contractors.

Formal training will ensure that staff members understand the purpose and expected outcomes of energy-efficiency measures, as well as their relevant roles and responsibilities. Establishing relevant standards, or adopting recognized ones, provides a valuable framework in which to ensure that staff has the appropriate tools for implementing efficiency measures.

Training needs should be identified for each facility operations employee. While even one session will provide benefits, the most effective environmental management training is regular and ongoing, and helps create an ethic of continuous improvement.

This Training Manual provides information and course descriptions on workshops and Continuing Education Units recommended to the staff of municipalities undertaking an energy retrofit program. Energy training, targeted for specific staff, is available from FCM, professional associations, utility providers and institutions for continuing education.

Workshops Provided by FCM

FCM has developed three energy retrofit workshops designed to highlight critical issues for the municipal sector and to enhance the capacity of participating municipalities to achieve energy-efficiency improvements.

These workshops have been redesigned from Natural Resources Canada's Dollars to \$ense Workshop series. Workshop material has been customized to include context and case examples specific to the municipal sector and to complement the step-by-step retrofit process advocated by FCM.

For the current schedule of workshops and fees, please contact FCM's Sustainable Communities and Environmental Policy Department at (613) 241-5221. More detailed descriptions are contained in this section.

Strategic Energy Planning A workshop that focuses on developing a thorough understanding of the municipal retrofit process advocated in this Guide and the management and planning tools needed to effectively and efficiently carry out the program.

Spot the Energy Savings Opportunities A workshop that develops knowledge of energy systems, technologies and operating practices, and techniques for identifying and assessing savings opportunities.

Monitoring and Verification A workshop that develops an understanding of the methodology of Monitoring and Verification (M&V), for the verification of energy savings, and in particular the process of Monitoring and Verification planning described in the International Performance Monitoring and Verification Protocol (IPMVP).

Non-FCM Energy Education Offerings

In addition to the three FCM workshops, training and continuing education units are offered by a number of other Canadian organizations including Natural Resources Canada, private institutions, community colleges, and utility providers. Brief outlines of some of these are included in this section. Additional course outlines of nationally and regionally available programs will be provided as they become available.

Index of Course Outlines in this Manual

Training Workshops for Municipal Governments Offered by FCM

- Strategic Energy Planning
- Spot the Energy Saving Opportunities
- Monitoring and Verification

Training Offered by other Institutions

Canadian Institute for Energy Training	<i>Certified Energy Manager Program</i>
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Seneca College Centre for Environmental Building Technology	<i>Building Environmental Systems</i>
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Natural Resources Canada – CANMET Energy Diversification Research Laboratory	<i>Renewable Energy Project Assessment Course</i>
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Canadian Energy Research Institute	<i>Annual Energy Seminars</i>
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Strategic Energy Planning Workshop for Municipal Governments

The Strategic Energy Planning (SEP) Workshop focuses on developing a thorough working knowledge of the MBR process and the management and planning tools needed to effectively and efficiently participate in the program.

Who Should Attend?

It is recommended that the entire energy team participate in the SEP Workshop. Inclusion of the entire group will improve communication and ensure that each team member feels connected to the entire process. Through this workshop, team members will become better equipped to articulate or “pitch” the objectives and anticipated benefits of the project to staff and elected officials outside the core team.

Recommended team members include:

- Finance
- Human/Employee Resources
- Engineering / building management
- Operations
- Council / political

Workshop Objectives

The SEP Workshop gives particular attention to the eight steps of the retrofit planning and implementation process advocated in the context of a strategic approach to energy management. It is designed to enable the participating municipalities to:

- understand and implement the MBR process, including its information resources, training programs, and templates, in terms of the tasks associated with each step
- in particular, utilize the Action Plan Template for the development of an organizational strategic energy management action plan (as defined above)
- develop and implement effective strategies for engaging the organization in the execution of the plan
- assess alternative financing strategies in general terms
- develop the “big picture” in terms of project goals, process elements, and criteria for success
- stand back and assess their progress in view of the overall program.

Workshop Outline

1. A Context for Strategic Energy Planning

- A Context for Planning – from team building to measurement and tracking (Why plan? What does the plan need to address? – actions, outcomes, resources, timelines, accountability, success factors)
- Establishment of workshop outcomes vis à vis Action Plan / Project Proposal

2. A Situation Assessment

- An organizational/behavioural assessment using the Energy Management Matrix debriefed and linked to the Green Leaf™ Assessment
- Identification of “key” barriers and next steps as action plan items to overcome these

3. The MBR Process & Decision Model Flow chart

- Walkthrough of MBR Process
- The Planning Decision Model

4. The Action Plan

- Familiarization with Action Plan Template

5. Implementation Options and Financial Analysis

- A Responsibility Matrix
- Energy Performance Contracts and ESCOs
- Financial Analysis
- Project Financing

6. The Project Proposal

- Benchmark Analysis
- Developing the Project Proposal

7. The Feasibility Study

- The Feasibility Study Template

8. Project Implementation

- Issues in Project Implementation

9. Monitoring and Verification

- Planning for Monitoring and Verification

10. Summary

- Next Steps
- A Context for Planning

Spot The Energy Savings Opportunities Workshop for Municipal Governments

The Spot the Energy Savings Opportunities Workshop provides a working knowledge of energy systems – the technologies and operating practices – and techniques for identifying and assessing savings opportunities. “Spot” is intended for municipalities beginning, or in the process of planning for the implementation of energy management and retrofit measures.

Who Should Attend?

Members of the energy team who will be working directly with energy consultants/contractors and those who will be responsible for operational aspects of the completed retrofits should attend.

Workshop Objectives

This Workshop is based on the NRCan-OEE Spot the Opportunities Workshop Guidebook. It is supplemented by three case studies developed for specific municipal government facilities (a recreation centre, an office building, and a water pumping facility). This workshop will enable the participating municipalities to:

- assess current energy use and facility performance data
- design and implement a facility audit process
- identify operational, maintenance, technological and facility retrofit energy management opportunities
- optimize energy purchase strategies
- make a preliminary assessment of the merits and feasibility of proposed measures
- select appropriate resources – internal or external – or conducting the audit and opportunities identification process

Workshop Outline

Getting Started

- Managing Energy Costs
- The Purpose of this Guide
- A Framework for Analysis
- The Energy Assessment Process

Energy Basics

- Energy and its Various Forms
- Units of Energy
- Electricity Basics
- Thermal Basics
- The Usefulness of Thermal Energy
- Heat Transfer - How Heat Moves

The Cost of Purchased Energy

- Purchased Energy Sources
- Purchasing Electrical Energy
- Purchasing Natural Gas
- Propane and Fuel Oil Rate and Billing

Up-Front Opportunities

- Savings Opportunities in the Demand Profile
- Savings Opportunities in Maximizing Combustion Efficiency
- Summary

The Electrical Load Inventory

- The Electrical Load Inventory
- Reconciling the Load Inventory with Utility Bills

The Thermal Energy-Use Inventory

- Identification of Energy Flows
- Know the Heat Source
- Conduction
- Air Flow - Sensible Heat
- Air Flow - Latent Heat
- Hot or Cold Fluid
- Pipe Heat Loss
- Tank Heat Loss
- Refrigeration
- Steam Leaks and Vents
- General Cautions
- Application to Sample Energy System

Identifying the Savings Opportunities

- Actions at the Point of End-Use Save More
- Waste-Loss Analysis
- Optimization of Energy Supply
- Savings by Inventory

A Checklist of Opportunities

- Applying the Savings Identification Process
- Fans and Pumps
- Compressed Air Systems
- Lighting Systems
- Refrigeration Systems
- Electric Motors
- Peak Demand Control
- Electric Purchase Optimization
- Boiler Systems
- Process Furnace, Dryers and Kilns
- Steam Distribution System
- Steam And Water Heating Equipment
- Process Insulation
- Ventilation/Exhaust Systems
- Space Conditioning Systems
- Process Equipment
- Cooling Systems
- Building Envelope Systems

Heat Recovery Systems

- Direct Heat Recovery
- Indirect Heat Recovery
- Calculating Savings from Heat Recovery

Assessing the Benefit

- A Comprehensive Assessment
- Detailed Electrical Energy Examples
- Detailed Thermal Energy Examples
- Environmental Impact

Monitoring and Verification Workshop for Municipal Governments

Monitoring and Verification is the eighth step in the MBR process. This is a critical element of successful energy management projects in general, and retrofits in particular. It is also an aspect of the retrofit process that must be considered well before a project is implemented.

The Monitoring and Verification Workshop for Municipal Governments emphasizes the importance of developing and implementing plans for monitoring and verification during the planning phases of a retrofit program, and enables municipal staff to develop the necessary strategies for carrying this out.

Who Should Attend?

This workshop will benefit those members of the energy team who will be working directly on the retrofit project, communicating with energy consultants/contractors, and those who will be responsible for operational aspects of the completed retrofits.

Workshop objectives

The Monitoring and Verification Workshop approaches the subject from the point of view of a planning methodology, enabling participating municipalities to:

1. Build Monitoring and Verification into their overall planning for a building retrofit under the FCM MBR process, or other energy management activities;
2. Develop their internal Monitoring and Verification capability, or their capacity to deal effectively with third party Monitoring and Verification service providers;
3. Assess the effort and resources required for implementation of an Monitoring and Verification strategy;
4. Use available data and energy measurement and control systems for Monitoring and Verification purposes;
5. Develop energy data collection, analysis and reporting procedures consistent with accepted protocols; and
6. Incorporate energy monitoring into overall facility management systems.

Workshop Outline

1. Introductions and Overview

- Key concepts in energy monitoring for verification and target setting
- Monitoring and Verification as an element of the MBR process

2. Monitoring & Targeting (M&T)

- Benefits of M&T as a management tool
- Data requirements for M&T
- Data analysis techniques
- Setting energy reduction targets
- Reporting for energy savings action

3. Verification Planning

- Fundamental relationships for calculating energy savings
- A case study
- Complexity as a driver for monitoring for verification planning
- The elements of a verification plan

4. A Framework for Verification

- A strategy for planning verification in the context of the MBR process
- Four methods of verification under the International Performance Measurement and Verification Protocol (IPMVP)

5. Verification Applied

- Data and information required to define the base year
- Techniques used for performance monitoring
- Application of a simple performance model
- Application of non-routine adjustments to the base year
- Uncertainty in savings verification
- Key measurement issues

6. Summary

- Review of key concepts and principles
- A verification checklist

Building Environmental Systems (BES) Program

Offered By

Seneca College, Centre for the Built Environment

Course Structure

Provides recognition through college accreditation, Energy Training Ontario Registry, Canada-wide Interprovincial Facility Training Accreditation Council (IFTAC / CAIFE).

The BES Program is recognized by Natural Resources Canada through its Office of Energy Efficiency, as the preferred comprehensive training resource for those entering an energy-savings project.

The BES program is tailored to individuals who continue in their workplace while completing the course requirements. Program materials can be provided in the following formats:

- Regular classroom environment, either at a training institution or at your workplace (dependent on potential class size). Numerous post-secondary education institutions across Canada are accredited to deliver the program (see list below).
- Distance learning that allows the student to study at home or work, by returning assignments through the mail and corresponding with an instructor in written, verbal, or e-mail formats.

Most units in the BES Program are available in both French and English. Contact Seneca College, Centre for the Built Environment for further details.

Who Should Attend?

The BES Program is intended as intensive continuing education for building operators and managers, technical sales representatives, energy auditors and building contractors.

It is recommended that trainees possess at minimum, a high-school education. Individuals who lack this formal level of achievement can succeed through a combination of practical work experience, combined with formal schooling.

Seneca College offers a needs assessment to determine the knowledge level of each prospective student (based on past education and practical work experience) in order to provide appropriate support during the course and to approve designation of equivalent credits where applicable. The needs assessment examines each prospective student on an individual basis, based on past experience and training as well as a personal interview. It is delivered through the workplace at a cost of \$350 to the employer. The results of this assessment include a three-year training plan that allows employers to budget for long-range training expenses. Students may receive equivalent credits for one or several of the required courses. As each course can cost between \$200 and \$400, the needs assessment pays for itself quickly.

For More Information

Further information about eligibility, needs assessment, course content, professional certification, course fees and schedules can be obtained from:

Mary Dawson
Energy Training Office
Seneca College, Newnham Campus
1750 Finch Ave. E
Toronto, Ontario M2J 2X5
1-800-572-0712
E-mail: mary.dawson@senecac.on.ca

Course Objectives

Students may select from two program platforms, depending on their current level of knowledge and intended application of their learning.

Operations Platform:

- Class II (seven subjects). Awarded to students who successfully complete the Practical Overview subject, and six core-level subjects.
- Class I (Class II certificate plus two subjects). Awarded to students with a Class II certificate who subsequently complete one of the three specialty subjects and the comprehensive level Energy Management subject.

Management Platform:

- BES Class I certificate plus six subjects. Awarded to students who have completed the Operations Platform Class I certificate and who subsequently complete four core-level management subjects and two options.

Some students with sufficient operational experience can enroll in the Management Platform without completing the Operations Class I certification. In this case, two additional subjects (BES700 and BES710 from the Class I certificate) are required.

Course Content

Participants in this program will receive:

- CD-ROM learning tool
- Large scale-diagrams
- In-class instruction at a community college or at the workplace (minimum 15 students)
- Direct telephone and Internet-based support from experienced instructors via e-mail, telephone, and computer conferencing (for distance education students)
- Student-to-student interaction via computer conference.

Topics Covered

Operations Platform, Class II Certificate

Entry Level – One Required Course

A Practical Overview of Building Systems – BES700

- Overview of the major building functions including heating, air conditioning, air handling, electricity, water treatment, and controls.

Core Level – Six Required Courses

- Heating – BES701
- Air Conditioning and Refrigeration – BES702
- Air Handling – BES703
- Electricity – BES704
- Controls – BES705
- Water Treatment – BES706

Operations Platform, Class I Certificate – requires completion of Class II Certificate and two additional courses from the following:

Specialty Level – Select 1 of 3 options

- Pipe Systems Design – BES707
- Air Systems Design – BES708
- Hospital Systems – BES709

Comprehensive Level – One Required Course

- Energy Management – BES710

Management Platform – Requires completion of Class I Certificate, an additional four core courses, and two electives

Core Level – Four Required Courses

- Property and Building Administration – BES801
- Site Maintenance and Building Safety – BES802
- Strategic and Financial Planning – BES803
- Human Relations – BES804

*Operations Level – Two Required Courses**

- Practical Overview of Building Systems (BES700)
- Energy Management (BES710)

*Required only for students who have not completed Operations Platform Class I certificate.

Options – Select 1 of 3 options plus one required

- Photovoltaic Technology
- Fire Safety
- Computer Systems
- Technical Writing (Required)

Certified Energy Manager (CEM) Program - Comprehensive Energy Management Course

Offered By

Association of Energy Engineers (AEE), through the Canadian Institute for Energy Training (CIET)

Course Structure

A five-day seminar focusing on energy cost reduction techniques and strategies. Attendance and successful completion of an exam on the last day will result in Certified Energy Manager designation. Curriculum is adapted to Canadian codes and standards from the CEM program developed by the Association of Energy Engineers (USA).

CEM certification is valid for three years and is renewable with continued employment in energy management work, membership in designated organizations, and completion of Continuing Education Units (CEUs).

The CEM course and certification represent four CEUs.

Who Should Attend?

The CEM program is recommended for energy managers who have broad responsibility for facilities management and energy procurement, as well as the design, implementation and evaluation of building retrofits and other energy-efficiency measures.

It is understood that participants will come to the program with a wide diversity of educational background and practical experience. Prerequisites to qualify are flexible to accommodate this, however each CEM candidate must meet one of the criteria listed below. Letters of reference and verification of employment must be submitted.

- A four-year engineering degree and/or P.E., with at least three years' experience in energy management.
- A diploma in Engineering Technology or four-year business or related degree, with at least five years' experience in energy management.
- A two-year technical diploma, with eight years' experience in energy management.
- Ten years or more verified experience in energy management.

For More Information

Further information about eligibility, course content, professional certification, course fees and schedules can be obtained from Mr. Doug Tripp at CIET, and the CEM page on the CIET Web site: <http://www.cietcanada.com>.

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 Fax 519-942-3555
 E-mail: dtripp@cietcanada.com
 www.cietcanada.com

Course Objectives

This special in-depth five-day seminar is ideal for professionals who seek a more detailed program of instruction covering the technical, economic and regulatory aspects of effective energy management. The program offers a comprehensive learning and problem-solving forum for those who want a broader understanding of the latest energy cost reduction techniques and strategies, and who want to achieve the CEM designation as recognition of their expertise. On the afternoon of day five, the Certified Energy Manager examination will be administered to seminar participants, or other candidates, who have applied for registration.

Course Content

Participants in this program will receive:

- Four and a half days of instruction by qualified energy management experts (the exam will be delivered on the afternoon of the fifth day).
- CEUs and course certificate – certificate of completion and four continuing education units.
- Comprehensive Course Workbook – written to function as a valuable resource both during the seminar course and on the job. Contains detailed guidelines, supporting data, and graphic elements to reinforce the points made during instructional sessions.
- Guide to Energy Management – the latest version of the text by Turner, Capehart, and Kennedy.

Topics Covered:

THE NEED FOR ENERGY MANAGEMENT

Building energy cost control
 Utility DSM programs – energy efficiency and peak demand reduction
 Commercial business energy cost control
 Industrial plant operation improvement

- reducing energy costs
- reducing environmental emissions
- improving product quality
- improving plant productivity

CONDUCTING AN ENERGY AUDIT

Purpose of the energy audit
 Facility description and data needs
 Major systems in the facility
 Data forms for recording information
 Collecting the actual data
 Identification of preliminary energy management opportunities

ENERGY AUDIT INSTRUMENTATION

The need for instrumentation
 Light level meters
 Electric meters

- voltages, current, power, energy, power factor

 Temperature-measuring instruments
 Combustion efficiency measurement
 Air flow and air leak measurement
 Thermography

ENERGY CODES AND STANDARDS

ASHRAE standards (62, 15, 3, 90.1)
 ASME, IEEE, and other standards
 Overview of Canadian Legislation and Regulations

- Energy Efficiency Act and Regulations, Model National Energy Code for Buildings, ODS regulations, etc.

 Montreal Protocol, Global Climate Change
 Canada's Energy Efficiency Guidelines
 Canadian Energy Utility legislation and regulations

BUILDING ENERGY USE AND PERFORMANCE

Fuel types and costs
 Energy content of fuels
 Energy conversion factors
 Building envelope
 Natural gas purchasing
 Retail wheeling of electricity
 Major building energy use systems

ENERGY ACCOUNTING IN BUILDINGS AND FACILITIES

Energy use index, energy cost index
 Where energy is used in facilities
 Lighting and HVAC energy use

ENERGY RATE STRUCTURES

Identifying types of energy used
 Electric rates, gas rates
 Oil, coal, and other rates
 Steam and hot water rates
 Factors in controlling fuel costs
 Utility incentive programs

ELECTRIC RATE STRUCTURES

Short history of electric rates
 The difference between power and energy
 Electric meters
 Components of electric rates
 Example rate structures
 Factors in controlling electric costs
 Electric utility incentive programs
 Special schedules (interruptible, TOU, real-time pricing)
 Canadian rate structures in a deregulated environment

ECONOMIC ANALYSIS OF ALTERNATIVE INVESTMENTS

Economic decision analysis
 Simple economic measures
 The time value of money
 Present and future values
 Cost and benefit analysis
 After-tax cash flows

ALTERNATIVE FINANCING

Role of performance contracting
 Different sources (loans, stock sales, bonds, etc.)
 Alternative financing

WASTE HEAT RECOVERY

Objectives: design criteria
 Types and maintenance of heat exchangers

LIFE CYCLE COSTING

Concept of life-cycle costing
Purchase costs vs. operating costs
Example analyzes
Government standards - FEMP

FUEL SUPPLY AND FUEL SWITCHING

Alternative fuel choices
Technology choices

- HVAC systems, boilers, heaters, industrial processes

Benefits of deregulation – electric and gas

ELECTRICAL ENERGY MANAGEMENT

Peak load reduction
Power factor improvement
Energy management control systems
Load management
Harmonics

LIGHTING

Basics of lighting and current lighting technologies
New lighting technologies
Economic evaluation of example lighting improvements
Lighting standards
EPA Green Lights program

MOTORS AND ADJUSTABLE SPEED DRIVES

How motors work
High-efficiency motors
Examples of cost-effective motor changes
Use of adjustable speed drives
Example of cost-effective ASD use
Improved motor belts and drives
Compressed air management

HVAC SYSTEM

Types of HVAC systems and new technologies
The vapour-compression cycle
Air conditioning loads
Chiller improvement example
Control, thermal storage, absorption systems

CONTROLS AND ENERGY MANAGEMENT

Night set back
Optimum start/stop
Enthalpy economizers
Temperature resets
PID controls, pneumatic controls
Control characteristics
DDC

INSULATION

Types of insulation
Heat flow calculations
Economic levels of insulation
Passive thermal energy
“Go where the action is”

BOILERS AND STEAM GENERATION

Basics of combustion systems

- excess air control

Boiler efficiency improvement

- blowdown management, condensate return, turbulators

Combustion controls
Waste heat recovery
Steam traps – purpose and testing
process insulation
Example of boiler improvement

COGENERATION

What is cogeneration
Types of cogeneration cycles
Examples of cost-effective use of cogeneration
QF's and deregulation
Use of waste for fuel

MAINTENANCE

Maintenance management systems
Monitoring for maintenance
Infrared photography for maintenance
Cost of:

- air, steam, gas leaks, uninsulated surfaces

RETScreen® International Renewable Energy Project Analysis Course

Offered By

Renewable Energy Capacity Building Program (RECAP) at the CANMET Energy Diversification Research Laboratory (CEDRL), in collaboration with the United Nations Environment Program.

CANMET is the Canadian Minerals and Energy Technology division of Natural Resources Canada.

Available at the on-line RETScreen International Renewable Energy Decision Support Centre.

Background on RETScreen® Software

The Renewable Energy Project Assessment Training Course and Workshops focus on the applied use of RETScreen® Renewable Energy Project Analysis Software, developed by CEDRL. RETScreen® is a tool that assists planners in incorporating renewable energy technologies (RETs) during the planning and feasibility stages of project development. The core of the tool consists of a standardized and integrated renewable energy project analysis software that can be used world-wide to evaluate the energy production, life-cycle costs and greenhouse gas emission reductions for various types of renewable energy technologies. In addition to the analysis software, the tool includes: product, weather and cost databases; an online manual; a Web site; and project case studies to support users in the application of the analysis tools.

RETScreen® software can be downloaded free from <http://retscreen.gc.ca/ang/menu.html>.

Course Structure

CEDRL offered a free, half-day introductory workshop in regions across Canada throughout 2001. This series trained over 700 people, primarily in the Federal government. 2002 should bring a new series, targeted at municipalities.

The half-day workshop forms the first (introductory) module of a nine-module course that explores the various modules of RETScreen® in detail. This course is delivered by certified RETScreen® trainers via local workshops and university courses.

The complete course will be available for on-line Distance Learning beginning in 2002.

Who Should Attend?

Relevant building and operations personnel in municipalities interested in or planning for the inclusion of renewable energy technology as part of their retrofit program or new building projects.

For More Information

Natural Resources Canada
CANMET Energy Diversification Research Laboratory (CEDRL)
1615 Lionel-Boulet Blvd., P.O. Box 4800
Varenes, QC, CANADA J3X 1S6
Phone: 450-652-4621
Fax: 450-652-5177
E-mail: rets@nrcan.gc.ca

Course Objectives

The main objectives of the course are:

1. To increase the awareness of public and private-sector energy stakeholders regarding the availability of cost-effective applications of renewable energy technologies; and
2. To strengthen the stakeholders' capacity to evaluate, plan, finance and implement renewable energy projects.

At the completion of the course energy planners, professionals and technicians will be able to perform high quality RETScreen® preliminary feasibility studies at low cost for potential renewable energy projects. Ideally, this will result in the implementation of more renewable energy projects.

Course Content

Participants in this program will receive:

- RETScreen® training manual
- Set of case studies – includes an assignment, completed RETScreen® Study (solution) and a description of the real project that was actually completed
- RETScreen® Engineering Manual – describes the algorithms and science behind the various models in the software
- CD-ROM containing RETScreen® software and databases (product, weather, and NASA satellite data)

Canadian Energy Research Institute – Annual Energy Seminars (Toronto and Calgary)

Participants' evaluations
CERI's Downstream seminar was informative, interesting and excellent with enthusiastic and energetic instructors. The instructors were very skilled at their presentation and very knowledgeable on the course material. I would have no hesitation in recommending this course to people either in the industry or indirectly involved in it.

Offered By

Canadian Energy Research Institute

For more information

For more information and current course scheduling, contact:

Lisa Wilkins
Training Services
Canadian Energy Research Institute
Telephone: 403 220 2374
Fax: 403 289 2344
E-mail: lwilkins@ceri.ca

Introduction to the Canadian Downstream Petroleum Industry

This seminar provides an overview of the downstream sector which, despite being the most visible part of the petroleum industry, remains little understood.

The seminar explains:

- The actual operations and a full array of topical downstream issues, and how the pieces fit together
- Complex refinery operations that involve state-of-the-art technologies
- The evolution to cleaner fuels in compliance with stringent environmental standards
- Retail economics and pump pricing dynamics
- Ongoing restructuring and investments to enhance competitive position
- Market, technological and other forces and dynamics that will drive the business in the future

Participants' evaluations

CERI's Upstream Petroleum Industry seminar was an excellent overview of the Canadian oil and gas industry; from exploration to production it identified the major aspects of the upstream petroleum industry and showed how they are inter-related. I have a much greater understanding of the industry and how things come together. The instructor was excellent, easy to follow, he made every topic clear, into an everyday occurrence, which I enjoyed very much. He was able to simplify concepts and relate them to real situations facing government, industry and common workers. I would have no problem recommending this seminar to anyone interested in the subject matter.

Summarized/paraphrased from past participants' evaluations

Attending the Natural Gas seminar was a great learning experience of the natural gas industry. My objective was to obtain an overall understanding of the industry and this was achieved, the pieces are fitting together. The instructor was excellent, knowledgeable and approachable. He delivered a dizzying amount of information in a well-paced and easily digestible fashion. Well worth the time and money, highly recommended to all my co-workers.

Introduction to the Upstream Petroleum Industry**The seminar explains:**

- The operations of the upstream petroleum industry, from exploration and drilling, to production, reserves and global dynamics, via a multi-media learning process
- The basic fundamentals as well as the terminology used
- The processes and technologies used to hunt for and produce hydrocarbon resources
- The assessment of risks involved in a very capital-intensive business
- The structure and dynamics of the industry, and the significance of seminar participants' jobs and contribution to their organizations' objectives

Introduction to the Canadian Natural Gas Industry...From Wellhead to Burner-Tip**The seminar explains:**

- Where natural gas comes from
- How the resource base is defined and measured
- The concept of mineral rights
- The basic technology behind drilling for and producing natural gas
- The regulations governing natural gas exploration, production, and transportation
- The three primary parts of the transportation system
- The factors that affect natural gas consumption
- How the natural gas market works
- The services provided by pipelines
- The expanding role of local distributing companies (LDCs)
- Natural Gas Consumption
- Natural Gas Market Dynamics

**Summarized/paraphrased
from past participants'
evaluations**

CERI's Electricity seminar has given me a thorough and informative overview of the operation of the electric utility industry. The facilitator was excellent. He took time to answer each question and was very aware of our personal needs to handle specific situations/concerns. An invaluable seminar that exceeded my expectations. Length of the seminar is ideal, I am very pleased and will recommend it to other employees.

**Charting New Frontiers: An Introduction to the
Operations and Restructuring of the Electric Power
Sector**

This seminar provides an independent and unbiased introduction to an important public policy issue to participants who are involved in the transition to a more competitive electricity industry.

The seminar explains:

- The historical evolution and overview of the actual operations along the value-added chain
- An independent and unbiased introduction to an important public policy issue to participants who are involved in the transition to a more competitive electricity industry
- The driving forces behind the transformation of the electric power sector to foster competition and capture the benefits that arise from increased efficiencies
- The issues, choices and trade-offs faced by policy makers and the business community in developing and implementing a consistent electric reform agenda
- The milestones and key developments during the transitional period in various jurisdictions as the power industry restructures its operations and develops new market structures and mechanisms