TNERGY TECHNOLOGY XII

Prices & Uses

ENERGY TECHNOLOGY XII

Prices & Uses

PREFACE

Energy as a policy issue has faded in Washington and in the eyes of much of the public. Because most of the symptoms have cleared up, many believe the problems have been solved or, at least, are in the hands of capable and responsible people.

And, of course, to a degree they are correct. The numerous individual, corporate and government actions that have been taken since the first crisis in 1973 have corrected many of our energy problems. Supplies are more secure, sources are more diverse, and uses are more efficient. Without a doubt we are much better prepared for energy supply disruptions now than we were in 1973.

However, as has been observed by some, we are in the eye of the hurricane. As a child near the coast of Rhode Island, I remember vividly the infamous 1938 killer hurricane. Following ferocious winds and rain, suddenly we were in the eye with no wind and beautiful clear skies. Many people, believing the storm was over, ventured from the relative safety of their homes to survey the damage and rejoice in their survival—only to be hit suddenly with the other side of the storm with equal ferocity.

The fundamental facts have not changed. Fossil fuels, which provide most of our energy, are finite and are being depleted with oil, our most convenient, being the first to go. The population of the world continues to expand and we continue to work toward an increasing average standard of living with the corresponding increase in energy consumption. Much remains to be done for an energy secure and prosperous future—although now with less government and public support.

Fortunately, as the papers in these proceedings demonstrate, persons and organizations in industry, academe and government continue to work diligently to improve and use technology for effective and efficient energy supply, distribution and use. Because of these efforts, the present is more comfortable and we will better survive the other side of the storm.

The 12th Energy Technology Conference has served its purpose well. And next year it will again show more important progress in the continuing process of assuring a bright future.

Richard F. Hill Editor

PROGRAM ADVISORY COMMITTEE for the

1985 ENERGY TECHNOLOGY CONFERENCE

Graham Armstrong Energy, Mines & Resources (Canada)

Leonard C. Axelrod U.S. Synthetic Fuels Corporation

Michael Bergman American Public Power Association

Robert D. Bessette Old Ben Coal Company

Steven Biegel National Institute of Building Sciences

Millard E. Carr U.S. Department of Defense

Albert T. Christensen General Electric Company

Christopher E. Crittenden Higher Education Energy Task Force

James Demetrops U.S. Department of Energy

Fred J. DiLisio U.S. Postal Service

Lowell J. Endahl National Rural Electric Cooperative Assn.

Leonard W. Fish American Gas Association

James W. Freeman Washington Gas Light Company

Thomas A. Gamble Hercules/Council of Industrial Boiler Owners

Martin L. Heavner Government Institutes, Inc.

Michael D. High Tennessee Valley Authority Richard F. Hill University of Bridgeport (CT)

Robert L. Holden American Gas Association

William J. Huff Alternate Gas, Inc.

Thomas J. Humphreys Baltimore Gas & Electric Company

James S. Kane U.S. Department of Energy

Robert W. Kiernan National Association of Manufacturers

Martin Klepper National Assn. of Energy Service Companies

Thomas T. Leuchtenburg Gas Research Institute

Anthony L. Liccardi NUS Corporation

Harry Lobdell Illumination Engineering Society of N.A.

Robin MacKay The Garrett Corporation

Bennett Miller National Wood Energy Association

Joseph Mullan National Coal Association

James H. Poland Virginia Electric Power Company

William R. Prindle Edison Electric Institute

Robert Rosenberg Gas Research Institute Richard L. Rudman Electric Power Research Institute

John Ryan U.S. Department of Energy

Peter E. Schaub Potomac Electric Power Company

Marvin Singer U.S. Department of Energy

Donald Slatton Apartment & Office Building Association

James F. Strother IEEE Energy Committee

Thomas F.P. Sullivan Government Institutes, Inc.

Robert I. Taylor Exxon Research & Engineering

Michael Tinkleman Electric Power Research Institute

Tyler E. Williams, Jr. National Energy Resources Organization

Walter H. Winnard Battelle Memorial Institute

Herbert Wheary Virginia Electric Power Company

Joseph Yancik U.S. Department of Commerce

John W. Yewell Maryland State Department of Education

Fred H. Zerkel Institute of Gas Technology

INVOCATION

Let us pray...

Almighty God, you are the source of creative power underlying all of life. We acknowledge you have commissioned us to be co-creators with you in inhabiting and developing the bountiful treasures and resources of this planet we call earth. Help us recognize these treasures as having been created for all generations. We thank you for this awesome opportunity and in humility we ask your guidance in implementing your purposes for this earth, for others, and for ourselves.

Bless this gathering of the 12th Energy Technology Conference and Exposition. Call to our remembrance all those who have labored and shared their abilities, made great sacrifices that we might have the benefits that are ours this day in the field of energy and its related technologies. Give us the insight and resolve to continue to build upon that storehouse of knowledge and experience so that greater benefit will be available to all.

Thanksgiving is in order for all those who have gathered and will gather to participate in this conference. May all the human resources gathered here be blended and refined into a productive advancement of present needs. Yet make us mindful that our need and desire to be profitable and fruitful must be tempered by commitment to moral and spiritual values. Grant that there be a spirit of openness and unity in forwarding goals based not upon expediency which is for the moment, but upon principles for the ages.

May we work and build according to your will so that when we pause to give an accounting of our stewardship it will be acceptable and worthy of the trust that you have invested in us. So guide us that the co-creative efforts and collective accomplishments generated here be divinely directed so as to enhance the quality of life on this earth, and broaden its spiritual dimension. Amen.

The Reverend Lynn Cairns Hyattstown United Methodist Church Hyattstown, Maryland

Bookshelf for Energy Professionals

New titles to save your company money & enhance your career growth!



Cogeneration Prospects & Opportunities, 4th Edition.

Assesses the current legal, regulatory, and economic requirements for successful cogeneration project development andustrial, commercial, and institutional facilities. Contributing authors are top facilities. Contributing authors are tog cegenaration professionals with hands-on experience. Topics include cogenera-tion feasibility analysis, Federal Energy Regulatory Commission developments, electric utility negotiation, alternative financing techniques, the role of packaged cogeneration systems, case histories of successful projects, and more. Edited by successful projects, and more Cogeneration Coalition. 211 pp., Softcover.

2. Energy Reference Handbook, 3rd Edition

Gret Edition Easy-to-find terms, acronyms, facts and data. It. total, more than 3,500 terms, key words and phrisases used daily in energy literature are accurately defined and easily referenced in its glossary section. Also includes special section of engry section, according to the section of the section of energy statistics, maps, tables and graphs with emphasis on alternate energy supplies. 449 pp., Hardcover, filtus.

3. Energy Efficiency in Buildings and

 Energy Efficiency in Buildings and Industry.

Learn how to reduce energy costs and improve profils through effective energy management. Learn about financing cogneration projects or retrofitting cogneration.

Become an educated energy manager. Become knowledgable about alternate energy technologies about alternate energy technologies. Both energy technologies about alternate energy technologies about alternate energy technologies.

Bessel energy technologies about alternate energy technologies about alternate energy technologies. Bessel energy technologies about alternate energy technologies about alternate energy technologies. Bessel energy technologies about alternate energy technologies about alternate energy technologies about alternate energy technologies.

Bessel energy technologies about alternate energy technologies about alternate energy technologies.

Bessel energy technologies about alternate energy technologies about alternate energy technologies.

Bessel energy technologies about alternate energy technologies about alternate energy technologies.

Bessel energy technologies about alternate energy technologies.

Bessel energy technologies about alternate energy technologies about alternate energy technologies.

Bessel energy technologies about alternate 774 pp., Softcover #453

Evaluating the FBC Option, 1984 Ed. Evaluating the FBC Option examines the technical, engineering, regulatory, and economic requirements for successful fluidized bed combustion projects. FBC is a proven technology which eliminates crubbers and makes it possible to burn coal in a clean, efficient manner. Not only the standard of the along with business, regulatory and financial information to allow you to

evaluate the FBC option in your particular

286 pp. Softcover

 Environmental Law Handbook,
 8th Edition
 A best-seller in the environmental field, this remarkably useful handbook provides practical and current information on the major entical and current information on the major environmental areas with a chapter each on air pollution, water pollution, land use, pesticides, toxic substances, noise, hazardous
westes (RCRA), OSHA, Superfund, Safe
Drinking Water Act, Manine Sanctuaries Act,
and NEPA, plus a comprehensive review of
the fundamentals basic to environmental lawenvironmental lards: constitutional law-uitmirronmental lards: constitutional law-uitenvironmental torts, constitutional law, evidence defenses, who can sue, civil and crimi

nal liability 544 pp., Hardcover

6. Energy Audits Manual

6. Energy Audits Manual Save money and conserve energy with this step-by-step, delated energy management manual for building owners and managers of commercial, industrial and government complexes, engineers, maintenance supervisors, and doi-lyourselfers in casty to understand language you will align how to read utility meters, maintain and operate outdishness and boolers, plan energy-efficient conditioners and boolers, blan energy-efficient lighting, reduce hot water usage, and assess the feasibility of implementing new energy technologies. The manual includes hundreds of sample problems, audit calculations. worksheets. 332 pp., Softcover

7, 1984 Cogeneration in California

California's unique cogeneration oppor-tunities and challenges are documented tunities and challenges are documented in this book developed from materials presented at Government Institutes' cogeneration conference in June 1984. Reflecting both the cogenerator and the utility prospectives, the book explores the status of cogeneration projects planned or now under way in the State; performing economic analyses of potential projects; recent developments in air quality and economic analyses or potential projects; recent developments in air quality and other regulatory issues; Calfornia's Standard Offer #4 and long-term avoided costs; financing cogeneration projects, and case studies of successful cogeneration applications in the State 200 · pp., 3-Ring Binder #479

8. Cogeneralian Ts. Inclose, Mandbook.
Professional engineer Loseph Orbando leads
you steptly-vision though each type of openeration technology. the individual system, components, end-use applications, and interconnection requirements. He supplies detailed case histories and showly vul how to conduct a cogeneration feasibility study of conductivity of the provides as posed up-to-ditle section on packaged cogeneration exhibitions of the provides and a glossary of important terms graphs to help you better understand how and wny cogeneration can work for you.

178 pp., Softcover 8473

 1984 International Gas Research Conference Proceedings;
 Conference Proceedings;
 Application of the Month of Service Proceedings and confilming research in the world of gase; ous fuels. These new proceedings include papers from experts from around the world fogics include natural gas production and resource operations. Topics include natural gas production and resource potential, coal gastinetian process-es and technology, methane from biomass and from waster, industrial combustion sys-tems, residential and commergial ublication, and milder unimerous charts. diagrams, and graphs illustrate the text. Learn as expens worldwide update you on gas technologies, and markets, environmental concerns, efficien-and markets, environmental concerns, efficienvelopment on gas technologies 1,200 pp., Hardcover #449

Guarantee: Your complete satisfaction with any of these books or you may return your order undamaged within 15 days for a full and immediate returnd

To Order Your Energy Books, Phone Us' With Your Credit Card or Write to:

Government Institutes, Inc.

966 Hung: ord Drive, #24 Rockville, MD (Washington, DC) 20850 (301) 251-9250

of the market the same of

IS YOUR ET SERIES COMPLETE?

To enhance your knowledge of energy technology and to gain a historical perspective on the growth of the energy industries in the United States and abroad, your energy bookshelf should contain a complete set of Energy Technology Proceedings I through XII. Available individually, the Energy Technology Series represents the most complete information on all major energy sources—fossil, nuclear, hydro, renewables and others—compiled in the last twelve years.

Furthermore, the Proceedings reflect the slow but steady development of a national energy policy over these crucial years. With a list of contributing authors that reads like a Who's Who in the international energy community, the Energy Technology Conference Proceedings are sure to become an invaluable element of your energy reference library.

Order the copies you've missed by calling us at (301) 251-9250 with a credit card number or by sending a letter to the address below stating the books you would like to order. Checks can be made payable to Government Institutes, Inc. We accept Visa or MasterCard charges. Add \$2.00 per item for postage and handling. Maryland residents add 5% sales tax.

	the speed of the speed of the		
	Title	Pages	Price
ET 12:	Prices and Uses	1822	\$69.00
ET 11:	Applications & Economics A	1498	66.00
ET 10:	A Decade of Progress	1478	56.00
ET 9:	Energy Efficiency in the Eighties	1562	52.00
ET 8:	New Fuels Era	1454	48.00
ET 7:	Expanding Supplies & Conservation*	1582	25.00
ET 6:	Achievements in Perspective	1152	38.00
ET 5:	Challenges to Technology	1072	38.00
ET 4:	Confronting Reality	484	30.00
ET 3:	Commercialization*	335	25.00
ET 2:	International	344	25.00
ET 1:	Energy R & D*	253	25.00

^{*}Available only in microfiche.

Prices subject to change without notice.

Government Institutes Inc. 966 Hungerford Drive, #24 Rockville, MD 20850 (301) 251-9250

TABLE OF CONTENTS WE BE EXPERIENCED A SPECIAL FOR

OPTOTAL ACCORDANCE OF ACCORDANCE	LOOK AT MA
Part I: POLICY OF POOR	AL PAGE IS R QUALITY
	Of the Observation
THE STATE OF ENERGY—A LONGER-TERM PERSPECTIVE John R. Miller	
ENERGY POLICY AND TAX REFORM C. Clinton Stretch	10
THE CALIFORNIA PERSPECTIVE ON ENERGY TECHNOLOGY Charles R. Imbrecht	17
ENERGY TRENDS IN THE NEAR TERM Albert H. Linden, Jr.	28
ELECTRICITY AND ALUMINUM'S FUTURE C. F. Fetterolf	34
Part II: ENERGY ANALYSIS, PLANNING AND REGULATION	ON
WINNING ENERGY STRATEGIES FOR PEPCO AND ITS CUSTOMER Larry B. Barrett	KS 42
DAY WINGS IN A COMPANY OF THE COMPAN	
BALTIMORE/WASHINGTON AREA UTILITY PERSPECTIVES AND INNOVATIONS—A PERSPECTIVE AS SEEN BY WASHINGTON GAS LIGHT COMPANY James W. Freeman	49
ENERGY OUTLOOK FOR THE EIGHTIES W. David Montgomery	54
CONSERVATION AND THE ENERGY DEMAND OUTLOOK Dale W. Steffes	58
ENERGY OUTLOOK W. R. Finger	64
SOME CASE STUDIES IN ENERGY TECHNOLOGY COMMERCIALIZATION	
Rick W. Diehl	70
INTER-FUEL COMPETITION IN RESIDENTIAL AND COMMERCIAL MARKETS	77
John D. Pearson, Barry Cohen, John Holte	o establica o establica
INTERFUEL COMPETITION IN THE U.S. INDUSTRIAL MARKET	86

Glen E. Schuler, Jr., L. Roy Kavanaugh

INTERFUEL SUBSTITUTION SESSION AUTOMOTIVE INDUSTRIAL PERSPECTIVE MANUFACTURING & TRANSPORTATION FUELS Richard Hood, Terry E. Pritchett	101
RELIABILITY CONCEPTS IN BULK POWER SYSTEMS Harry W. Colborn	110
A LOOK AT NATIONAL AND REGIONAL ELECTRIC SUPPLY NEEDS J. Steven Herod, Jeffrey Skeer	120
FINANCIAL AND REGULATORY ISSUES OF PACKAGED COGENERATION Michael J. Zimmer	131
PRECIPITATION CHEMISTRY IN THE EASTERN UNITED STATES Mary A. Allen, Peter K. Mueller	151
ACIDIC DEPOSITION AND SOIL PROCESSES Robert M. Newton, Richard H. April	164
ACIDIC DEPOSITION EFFECTS ON FORESTS IN THE UNITED STATES Dudley J: Raynal, David C. LeBlanc	173
PRACTICAL TOOLS FOR DEMAND-SIDE PLANNING Clark W. Gellings, Ahmad Faruqui, David E. Jones	185
ORGANIZING FOR A DEMAND SIDE MANAGEMENT PROGRAM ALTERNATIVE APPROACHES Michael Tinkleman	194
PEPCO'S APPROACH TO IMPLEMENTING A DEMAND SIDE MANAGEMENT PROGRAM Robert C. Grantley	210
STRATEGIC MARKETING AND DEMAND-SIDE MANAGEMENT AT CP&L John S. Monroe, Jr.	223
THE CASE FOR MARKETING IN TODAY'S ELECTRIC UTILITY MOVEMENT Clark W. Gellings, David E. Jones	230
ASSESSING HEAT PUMP MARKETING STRATEGIES Todd D. Davis, Dilip R. Limaye	239
HOW TO STRUCTURE COGENERATION PROJECTS TO ATTRACT INVESTORS Alvin Bojar, J. Richard Garland	253
FINANCING ALTERNATIVES FOR COGENERATION AND SMALL-POWER FACILITIES John W. Pestle	263
RATE OPTIONS FOR CONSERVATION, LOAD MANAGEMENT AND MARKETING William H. Edwards	275

RATE DESIGN FOR QUALIFYING FACILITIES E. Odgers Olsen, Jr.	285
THE EQUITY SYNDICATION OF COGENERATION PROJECTS Jack Kadis	291
LEGAL AND REGULATORY CONSIDERATIONS FOR UTILITIES ENTERING THE TELECOMMUNICATIONS MARKETS Lee M. Weiner	296
ESTABLISHMENT OF REGIONAL COMMUNICATIONS NETWORKS BY ENERGY UTILITIES Donald E. Carlson	312
WHAT IS THE MARKET FOR FIBER OPTIC SERVICES? Michael L. Carr	317
DIDIOMDIAL DRIGHTS OF MACHINE	
INDUSTRIAL PRICING OF NATURAL GAS: THE HISTORICAL PERSPECTIVE Philip M. Marston	324
DOLE OF MALE CAS DISCUSSION OF THE PARTY OF	
ROLE OF THE GAS DISTRIBUTION COMPANY IN DEREGULATED ENVIRONMENT Richard Hare	332
POWERMANAGER: A MODEL FOR INDUSTRY-DEVELOPED	
PC SOFTWARE Peter A. Daly	339
EPRI ADVANCES IN MICROCOMPUTER APPLICATIONS James J. Mulvaney	344
A LEGAL ANALYSIS OF THE EXPORT TRADING COMPANY ACT AND ITS IMPACT OF THE EXPORT OF ENERGY TECHNOLOGY Eleanor Roberts Lewis	353
By DODMING GOAL THE CHARLES	
EXPORTING COAL THROUGH TECHNOLOGY & COUNTERTRADE Erast Borissoff	365
Part III: USING ENERGY EFFECTIVELY	
GAS BURNER SYSTEMS DEVELOPMENT Michael A. Lukasiewicz	374
FLUIDIZED BED HEAT PROCESSING Anthony G. Fennell	387
RTA CENTRAL RAIL MAINTENANCE FACILITY THERMAL	
STORAGE SYSTEM	000
William M. Bush	399
THE STRONG CASE FOR THERMAL ENERGY STORAGE AND UTILITY INCENTIVES Loren W. McCannon	408
··· · · · · · · · · · · · · · · · ·	

DESIGN CONSIDERATIONS-FOR FIRST COST CONTROL OF ICE STORAGE SYSTEMS Thomas W. Brady		414
FACTORS IN EVALUATING COGENERATION APPLICATIONS David J. Ahner, Eldon W. Hall		421
RECENT TRENDS IN INDUSTRIAL ELECTRIFICATION Calvin C. Burwell	14	434
NEW INDUSTRIAL PROCESS TECHNOLOGIES AND INDUSTRIAL ELECTRIFICATION I. Leslie Harry UTILITY PROGRAMS FOR INDUSTRIAL ELECTRIC	1234 1234 195	443
TECHNOLOGY TRANSFER Paul R. Stewart		450
PROSPECTS FOR ADVANCED ABSORPTION RESIDENTIAL GAS-FIRED HEAT PUMP TECHNOLOGY David A. Ball, William T. Hanna, William H. Wilkinson, Arthur R. Maret		458
THE APPLICATION OF ADVANCED STIRLING ENGINE TECH- NOLOGY TO A COMMERCIAL SIZE GAS-FIRED HEAT PUMP Lennart Johansson, John Agno, Jaroslav Wurm		468
GUARANTEED CASH FLOW CONTRACTS IN PUBLIC SCHOOLS: THE WASHINGTON COUNTY MARYLAND EXPERIENCE Ralph E. Giffin		482
NEW YORK CITY'S EXPERIENCE WITH SHARED SAVINGS CONTRACTS IN MULTI-FAMILY BUILDINGS W. R. Wentworth		490
BUILDING CONTROL CRITERIA James D. Rivette		499
CONTROLLING THE INTELLIGENT BUILDING Richard J. LeBlanc		506
INTEGRATED ENERGY SYSTEMS FOR SHARED TENANT SERVICES Dale U. Bunce	}	511
SMART OR INTEGRATED SYSTEMS BUILDINGS—TOMORROWS BUILDINGS TODAY Carl F. Klein, R. E. Neubauer		518
ECONOMIC STRATEGY FOR INSULATION RETROFIT Frank R. Gerety		525
POWER & PROCESS AND PETROCHEMICAL ENVIRONMENTS CONTEMPORARY SOLUTIONS FOR SYSTEM UPGRADE AND	5.3	
MAINTENANCE J. P. Turker		531

SUCCESSFUL FINANCING FOR INSTITUTIONAL USERS: CASE STUDY OF EXPERIENCE WITH NEW YORK CITY Pat Benjamin A PENNY SAVED IS HALF PENNY EARNED: PENNSYLVANIA'S THIRD PARTY FINANCING EXPERIENCE FOR ENERGY	539
CONSERVATION Anthony J. Rametta, Robert A. Shinn	547
I DID NOT INSTALL AN EMS Wilbur A. Claflin	554
HIGH TEMPERATURE COMPOSITE THERMAL STORAGE SYSTEMS FOR INDUSTRIAL APPLICATIONS Randy J. Petri, Estela T. Ong	556
APPLICATION OF HIGH TEMPERATURE RADIANT TUBES William J. Taus	569
LIGHTING DESIGN CONSIDERATIONS FOR EFFECTIVE ENERGY UTILIZATION Sandra M. Stashik	577
LIGHT SOURCES FOR THE EIGHTIES David A. Krailo	587
LIGHTING FOR VISUAL DISPLAY TERMINAL AREAS Gary R. Steffy	595
CERAMIC RECUPERATOR DESIGN FOR AN ALUMINUM RECLAMATION FURNACE M. E. Ward, T. A. Argabright, W. W. Liang	600
THE THERMOCHEMICAL RECUPERATOR SYSTEM—ADVANCED HEAT RECOVERY Donald K. Fleming, Mark J. Khinkis	608
HIGH-TEMPERATURE CERAMIC RECUPERATORS FOR INDUSTRIAL APPLICATIONS M. Coombs, H. Strumpf, D. Kotchick	618
SMALL PACKAGED HEATING/COOLING COGENERATION SYSTEMS Dennis T. Wilson	628
COGENERATION FOR SUPERMARKETS David Walker, Scott Hynek	632
ADVANCED TECHNOLOGY FOR PACKAGED COGENERATION SYSTEMS Lawrence J. Kostrzewa	642
RESIDENTIAL APPLICATIONS OF ENERGY RATING SYSTEMS Mark D. Friedrichs	653
TOOLS OF THE TRADE Donald G. Carter	660

INCENTIVES FOR CONSERVATION Harold B. Olin	666
LIGHTING CONTROL EQUIPMENT AND APPLICATIONS R. R. Verderber	679
NEW DEVELOPMENTS IN LIGHTING CONTROLS Richard Dunlop	688
A FUNCTIONING AUTOMATED UTILITY MANAGEMENT SYSTEM FOR 100 BUILDINGS Michael T. Shehadi	695
MONITORED ENERGY PERFORMANCE OF NEW AND RETRO- FITTED BUILDINGS: SOME RESULTS FROM THE BECA DATA COMPILATIONS Alan K. Meier	704
IMPLICATIONS OF SUPER WINDOWS FOR ENVIRONMENTAL CONTROL Greg Allen	714
PATCHING THE THERMAL HOLE OF WINDOWS Thomas F. Potter	718
THE IMPACT OF GROUNDWATER CONTAMINANTS ON INDOOR AIR QUALITY J. H. Highland, R. H. Harris, D. T. Harrie, C. W. English, C. F. Weiss	728
SOLUTIONS TO INDOOR AIR QUALITY PROBLEMS IN TIGHT HOUSING J. E. Woods, B. C. Krafthefer, J. E. Janssen	741
HIDDEN PROBLEMS IN DAYLIGHTING Donald R. Wulfinghoff	753
THE LIGHT PIPE—DESIGN FOR EFFICIENCY S. N. Hockey	759
DEVELOPMENT AND TESTING OF AN ELECTRIC FARM TRACTOR L. L. Christianson, R. Alcock, D. Froehlich W. Knabach, L. Endahl	766
UPDATE ON THE ELECTRIC VEHICLE DEVELOPMENT CORPORATION Gerald H. Mader, Michael D. High	776
STATE OF KNOWLEDGE OF ENVIRONMENTAL CONCERNS RELATED TO NATURAL-GAS-FUELED VEHICLES Margaret K. Singh, David O. Moses	786
TRENDS IN COMMERCIAL BOILER EFFICIENCY James V. Goins	793

HIGH EFFICIENCY BOILERS—COST/BENEFIT FOR APARTMENT OWNER Stan Zaborowski, Chris Barringer, Doug Cane, George Kato	803
HIGH TEMPERATURE WATER FOR PROCESS HEATING IS IT WORTH THE INVESTMENT? Jeffrey A. Beals	813
NEW TRENDS IN UTILITY CONSERVATION FINANCE PROGRAMS: THE BPA PURCHASE OF ENERGY SAVINGS PROGRAM Marlene L. Michaelson	827
A UTILITY'S DECISION TO ESTABLISH AN ENERGY SERVICES SUBSIDIARY Mike Weedall	835
AN ELECTRICAL ENERGY TRACKING AND ANALYSIS SPREAD- SHEET HELPS PROVIDE ANSWERS WHEN THE QUESTION: "WHY IS POWER UP?" IS ASKED John L. Fetters	848
A CONCEPT FOR MEETING THE WHOLE HOUSE HEATING LOAD USING A PULSE COMBUSTION SPACE HEATER Jeffrey L. West, William H. Thrasher, Larry R. Brand	857
GAS APPLIANCE RESEARCH AND DEMONSTRATION HOUSE— A TOOL FOR THE FUTURE Robert J. Kolodgy, Roy A. Marchant, Susan M. Sobieski	867
ENERGY MANAGEMENT SYSTEMS, THE OWNER'S ROLE IN THEIR SELECTION, IMPLEMENTATION AND OPTIMIZATION Philip D. Sayers	875
ENERGY MANAGEMENT SYSTEMS, THE OWNER'S ROLE IN THEIR SELECTION, IMPLEMENTATION AND OPTIMIZATION Samuel F. Reeves	879
BETT YARDSTICK, AN APARTMENT ENERGY USE DATABASE Stan Zaborowski, Roger Peters, Gillian Mason	889
ADVANCED HEAT PUMP RESEARCH AND DEVELOPMENT SPONSORED BY THE U.S. DEPARTMENT OF ENERGY Michael A. Kuliasha	898
COMBUSTION EQUIPMENT RESEARCH John W. Andrews	908
SYSTEM DEVELOPMENT AND CONSTRUCTION IN JAMESTOWN, NEW YORK Ishai Oliker	928
DESIGNING AND DEVELOPING A DHC SYSTEM IN PROVO, UTAH Garth S. Limburg	941
OPERATION AND EXPANSION IN PIQUA, OHIO; DEVELOPMENT IN BALTIMORE Mark E. Luttrell	950

MICROCOMPUTER SOFTWARE FOR ENERGY CONSERVATION INVESTMENT ANALYSIS Michael W. Reid	958
ENERGY CONSERVATION ECONOMICS BY INVESTMENT EQUIVALENTS Robert J. Larson	966
COMPUTERIZED IDENTIFICATION OF ENERGY CONSERVATION MEASURES David Farrell	ON 974
DESIGN DEVELOPMENT OF TVA'S AFBC DEMONSTRATION PL James W. Bass III, C. J. Aulisio, W. C. Howe, A. M. Manaker	ANT 987
Part IV: TECHNOLOGIES FOR FOSSIL, NUCLEAR AN GEOTHERMAL RESOURCES	ND
CFB TECHNOLOGY APPLIED TO LIFE EXTENSION OF NUCLA GENERATING STATION K. J. Heinschel, F. A. Heacock, Jr., M. B. Devereux	998
NORTHERN STATES POWER COMPANY (NSP) BLACK DOG GET ATING PLANT—UNIT 2 EMISSION REDUCTION, CAPACITY, INCREASE AND LIFE EXTENSION THROUGH ATMOSPHERIC FLUIDIZED BED COMBUSTION (AFBC) RETROFIT B. L. Jenness, S. M. Rosendahl, R. L. Gamble	NER- 1007
WHY CONSIDER LIFE EXTENSION? A STRATEGIC ALTERNATION OF UTILITIES Stephen G. Salay	IVE 1036
WHAT DOES LIFE EXTENSION INVOLVE: EXPERIENCE AT DUKE POWER Robert M. Sandifer	1043
EXPERIENCES WITH 100 TO 450KW COGENERATION SYSTEMS Dennis T. Wilson	1060
THE SUCCESSFUL OPERATION OF A 36MW PULP AND PAPER COGENERATION SYSTEM Robert A. Brown	1067
THE STELLARATOR APPROACH TO FUSION PLASMA CONFINEMENT	1082
J. H. Harris	
AVAILABILITY AND PERFORMANCE IMPROVEMENT PROGRAM IN THE SOUTHERN ELECTRIC SYSTEM J. K. Legg	AS 1095
RECENT ADVANCES IN IMPROVING TURBINE-GENERATOR AVAILABILITY AND PERFORMANCE R. C. Spencer	1105

ROLE OF FUEL CELLS IN INDUSTRIAL COGENERATION E. H. Camara	1116
SOUTH POINT COAL WATER FUEL PLANT OPERATIONS Phillips C. Emmons, Richard V. Carlson, William R. Sigler	1125
THE PRODUCTION AND UTILIZATION OF COAL WATER FUELS N. D. Brown, R. A. Passman	1133
REQUIREMENTS OF UTILITY AUTOMATION SYSTEMS Richard S. Heiser	1150
RADIO COMMUNICATIONS SYSTEM FOR UTILITY AUTOMATION J. D. McDenald, W. C. Pfannkuch, S. A. Thomas	1159
ECONOMIC EVALUATION OF DISTRIBUTION AUTOMATION Jennings B. Bunch Jr.	1169
OUTLOOK FOR THE SHALE INDUSTRY IN THE UNITED STATES Forrest L. Poska	1179
PROSPECTS FOR COAL BASED SYNFUELS COMMERCIALIZATION John T. Foti	1185
COMMERCIAL STATUS OF SYNFUELS INDUSTRY OUTSIDE OF USA J. R. Bowden	1195
A STATUS REPORT ON DOE'S COAL-WATER MIXTURES PROGRAM Charles R. McCann, Roy C. Kurtzrock, Ralph A. Carabetta	1206
UNITED COAL COMPANY'S VIEW OF THE NEW COAL-LIQUID FUELS MARKET Richard A. Wolfe	1215
BABCOCK & WILCOX BARBERTON HEATING PLANT CWF CONVERSION Robert W. Zahirsky	1225
RETROFIT SO ₂ AND NO _x CONTROL TECHNOLOGIES FOR ELECTRIC UTILITIES Michael J. Miller	1235
ENGINEERING APPLICATION AND ECONOMICS OF LIMB Norman Kaplan, David G. Lachapelle, Jeff Chappell	1248
STATUS OF COMMERCIAL OIL SHALE DEVELOPMENT IN THE UNITED STATES Harley H. Barnes	1263
INTERNATIONAL DEVELOPMENTS IN OIL SHALE Douglas B. Uthus	1274
ENERGY FROM EASTERN OIL SHALES: AN OVERVIEW OF RESEARCH STATUS D. V. Punwani	1295

OVERVIEW OF DOE'S ADVANCED/MHD COAL COMBUSTOR DEVELOPMENT PROGRAMS Ralph A. Carabetta, Charles R. McCann, Roy C. Kurtzrock		1311
THE BURNING OF COAL-WATER SLURRY FUELS IN A TWO-STAGE SLAGGING COMBUSTOR R. T. LeCren, D. J. White		1324
A LOW-NO _X STAGED GAS TURBINE COMBUSTOR CONCEPT FOR COAL-WATER SLURRY APPLICATION Colin Wilkes, David W. Clark		1336
DESIGN AND OPERATION OF THE MSFB CIRCULATING FLUID BED A. H. Rawdon, D. R. Gustafson		1346
PRACTICAL EXPERIENCES WITH LOW GRADE FUELS IN FLUIDIZED BEDS Albert M. Leon		1358
FBC STARTUP AND OPERATIONAL EXPERIENCE ON SEVEN FLUIDIZED BED BOILERS AT CAMPBELL SOUP COMPANY Larry L. Blakesley		1368
EXTENDING THE GASIFICATION PROGRAM RESEARCH AND DEVELOPMENT DOLLAR THROUGH JOINT GOVERNMENT/INDUSTRY FUNDING C. Lowell Miller, Kermit E. Woodcock		1378
OPERATION OF THE TVA AMMONIA FROM COAL PROJECT PLA M. C. Crim, E. D. Buggs	NT	1389
GREAT PLAINS GASIFICATION PROJECT STATUS REPORT Donald C. Pollock		1408
STATUS OF INTEGRATED COOL WATER COAL GASIFICATION COMBINED CYCLE PROGRAM C. B. McCarthy, P. K. Engel, T. L. Reed, D. F. Spencer, S. B. Alpert		1415
THE COMMERCIAL POTENTIAL FOR TEXACO-BASED COMBINED CYCLE POWER PLANT M. J. Gluckman, A. E. Lewis, T. R. Morton		1432
BVALUATION OF BRITISH GAS-LURGI SLAGGING GASIFIER FOR COMBINED-CYCLE POWER GENERATION Theodore R. Roszkowski, Herbert W. Klumpe, Helmut Vierrath, T. Beyer, Bryan H. Thompson		1442
GERMAN PILOT PLANT EXPERIENCES AND RESULTS J. Langhoff, E. Wolowski, R. Holighaus, U. Graeser		1455
JAPAN'S COAL LIQUEFACTION PROGRAM Katsuya Uehara		1465
THE U.S. COAL LIQUEFACTION PROGRAM T. M. Torkos, J. J. Lacey, J. P. Strakey		1473