Index

A

AACS, 109–113, 115, 116
  Chillers, 57
  refrigeration cycle, 90, 94, 95
  refrigeration system, 88
Abdelmessih, 64, 70
Abdulateefet, 68
Absorption
  air conditioning system, 109, 111, 114
Activation loss, 28
Activation polarization, 28
Adsorbent/adsorbate working pairs, 100
Adsorption
  Chillers, 59
  refrigeration system, ARS, 99
Advanced cycles, 95
AFC, 27, 38, 46–48
AHP, 105–108, 111, 116, 118, 119
Air conditioned, 105, 106
Air conditioning, 89, 94
Ajib and Gunther, 63
Albright, 89
Alkaline, 38, 45–47, 50
Alkaline electrolyte fuel cells, 45
Alkaline fuel cell, 27
Ammonia/barium chloride, 64
Ammonia/water, 56, 59, 61–68, 70, 72
Ammonia–water
  system, 89
Andrew D., 87
Andrews, 88, 101
Annual
  amount of tax, 137
  cash flow, 137, 139, 140
  cash income, 137, 138
  costs and cash flows, 137
Annuity
  due, 135
  of a future worth, 136
  of a present worth, 136
Aosol, 56, 62
Apollo and Orbiter, 45
Appleby A.J., 31, 52, 53
ARC with absorber-heat-recovery, 98
ARC with GAX, 97
Arivazhagan, 63, 71
Aronson, 89, 100
Aviation, 126
Avista Labs, 125

B

Ballard Power Systems, 39
Bar-on, 133, 153
Bipolar plates, 42
Blytas and Daniels, 89
Bourouis, 65, 71
Broad, 57
Bruno, 68, 71
Buffington, 87, 89, 101

C

Cabot®, 40
Caeiro, 63, 71
Capital costs, 137
  recovery factor, 136, 141, 143, 144, 146, 150
Carbon powder, 40

Carnot cycle, 77–80, 85
Carrier Co, 56, 111
Centralized *vs* distributed power generation, 16
Century, 56
Cerezo, 66, 71
Chang, 133, 154
Chase *et al.*, 28
Chekir, 69, 71
Chillii, 59
CHP, 35, 39, 41
systems, 120–122, 127
systems with fuel cells, 129
Classified by the operating temperature, 37
Clausius, 76, 101
Climatewell, 56, 58, 61
Climatic change problem, 6
Coal, 8, 11
Coefficient of performance, 78, 85, 92
COP, 95, 97–99, 106, 108, 109, 118, 119, 122
Cogeneration, 1, 5, 14, 16–22, 37, 43, 103, 109–113, 115, 116, 119
systems, 14, 19, 20, 107, 120, 121
Colibri, 56
Combined heat and power, 127
Commercial, 9, 20
Common electrodes used in alkaline fuel cells, 47
Continuous absorption cycle, 91
Coupling of technologies, 105
CRF, 136, 141, 143, 144, 150

D

Daido Hospital, 130
Daimler Chrysler, 126, 129
DC power supply, 124
DCFRR, 140
De Lucas, 64, 71
DEC, 53, 55, 56
Department of Energy, 125
Devault and Marsala, 96
Dicks A., 48, 53
Direct methanol fuel cell, 38, 43
Distributed generation, 124
Di-thermal cycle, 76, 77
DMFC, 38, 43, 44
DOE, 125
Dohle H., 44, 53
Double-effect, 56, 57, 68, 73
Dueñas, 89, 101
Dupont Co., 39

E

EAW, 56, 59, 60
Ebara Ballard, 125
Ecole Nationale d'Ingénieurs de Monastir, 63
Eding and Brady, 87
Efficiency of cogeneration, 108
Eggers-Lura, 89, 101
Eiseman B.J., 89
Electrochemical aspects, 25
Electrochemical reactions, 25, 27, 28, 38, 49
Electrochemical redox reactions, 38
Electrode
and assemblies, 40
components and catalyst, 49
Elements of profitability assessment, 134
Emergency backup power, 126
Energy
and development, 2
and economy, 3
and environment, 5
consumption by end-use sector, 9
conversion, 75
perspectives, 12
policy, 6
Research Center, 63
resources, 2, 4, 6, 9, 15
world overview, 7
Energy savings and efficient use of energy, 4
Entropie, 56
Entropy, 77–79
EOC, 108–115, 119
Equivalent tons of petroleum, 2
Equivalent uniform annual cost, 141
Estimating profitability, 138
Ethylene glycol/water, 64
EUAC, 141, 143, 144, 146, 147, 149, 150
European Union, 13
Ezzine, 63, 71

F

Farbir and Gómez, 133
Fernández-Seara, 70
Fiji Electric Advanced Technology Co. Ltd, 130
First law of thermodynamics, 1
Fixed capital costs, 137, 138
Ford, 126, 129
Foulkes F.R., 52, 53
Fraunhofer ISE, 60

Fuel cell, 14, 18, 19, 23, 24, 26–29, 31–35, 37–53, 55
classification, 37
efficiency, 33
energy, 124
in alkaline medium, 122
operation, 34
scooters, 125
technologies, 125
Future worth, 134, 135

G

Gas diffusion electrodes, 49
GAX, 67, 71, 72
GBU GmbH, 59
GE Microgen, 125
Gemini Space Vehicle, 121
General Electric, 38
Generator/absorber/heat exchanger, 97
Geothermal, 9
Gibbs-free energy, 26
Glebov and Setterwall, 64
Göktun, 68, 71
Gómez, 63, 71
Graz University of Technology, 62
Gross domestic product, 2
Grossman, 96, 101
Grotthus type, 48

H

H Power, 125, 127
H_2O/LiBr, 119
Hainsworth, 87, 101
Halogenerated hydrocarbons, 89
Hamnett A. and Kennedy B.J., 44, 53
He and Chen, 64
Heat pump, 78, 119
Heat recovery, 19
Heat to work, 75
Helmholtz free energy, 26
Hensel and Harlowe, 89, 101
Holland, 135, 137, 138, 154
Honda, 126
Hospital and Autonomous Applications, 130
Hwang, 68, 71
Hydroelectric power, 8
Hydrogenesis reaction, 104, 106
Hyundai, 126

I

Idatech, 125
Ideal cell voltage, 34
Ideal efficiency, 33
Ideal potential, 27, 28, 32
IEA, 56, 105, 121
Ihrig H.K., 45, 53
Industrial, 5, 10, 16, 20
Institute of Thermal Engineering, 62
Institute of Thermodynamics and Thermal Engineering, 61
Institution of Engineering and Technology Factfile, 128, 131
Intermittent absorption cycle, 90
Internal rate of return, 140
International energy annual, 7
International fuel cells, 50
International relationships, 4
Invesnsor, 56
Irr, 140
Islam, 66

J

J. Appleby and F. Foulkes 1989, 31
Jacob and Pink, 61, 71

K

Kaita, 67, 71
Kinoshita K., 50, 53
Koppel T., 39, 53
Kordesch K.V., 45, 50, 53

L

Larminie J., 40, 44, 48, 53, 129, 131
Le Pierrès, 64, 71, 89, 101
Lee, 65, 71, 73
LG, 56
Life cycle, 35
Lithium Bromide–Water, 90
system, 89
Lithium thiocyanate, 89
Locomotives, 125
Lord Kelvin, 76
Ludovisi, 66, 72

M

Macriss, 87, 101, 102
Macroeconomic, 3, 4

Maekawa, 56
Mansoori and Patel, 87
Mastrangelo, 89, 102
Matsushita Electric Industrial Co Ltd, 125
Maximum work, 32
Maycom, 56
Mazda, 126
Mc Quay, 56
Mcdougall A., 45, 53
MCFC, 31, 32, 38
MEA, 38, 41–43
Meacham and Garimella, 65
Medrano, 67, 72
Membrane electrodes assembly, 38
Methanol, 38, 43, 44
Methylamine–water solution, 89, 114–116, 120
  MMAW, 114, 118, 119
Meunier, 99, 102
Meyer, 56, 72
Microturbine, 68, 72
Military applications, 126
Mitsubishi, 56
Mobile and transportation applications, 125
Mohideen and Renganarayanan, 65, 72
Molten carbonate fuel cell, 27
Morillón, 119
Mugnier, 56, 62, 72
Multieffect ARC, 95
Muthu, 64, 72
Mycom, 56, 59

N

Nafion, 39, 41, 44, 122
Nanoparticles, 40, 51
NASA, 122
National University of Mexico, 63, 69
Natural gas, 7, 19
Nernst equations, 27
Net present cost, 139, 140
Net present value, 139
Nickel powder, 48
Niebergall, 84, 102
Nishyodo, 56
Nuclear electric power, 8
Nuvera, 125

O

Ohmic polarization, 29
Oka Y., 130, 131
On-site power, 124
Operating
  conditions, 107
  pressure, 32
  temperature, 31
Ordinary annuity, 135

P

Park, 67, 72
Payback period, 138
PEMFC-AACS, 133, 134, 141, 149–152
PEMFC-CACS, 134, 141, 148, 149, 151, 152
Petroleum, 7, 12
Phosphoric acid fuel cell, 27, 38
  PAFC, 27, 36, 38, 50–53, 55
Physiochemical characteristics, 37
Pilatowsky, 68, 72, 89, 103, 106, 108, 114, 119
Pink, 56, 59, 61, 71
Platinum, 39, 40, 44, 49, 50
Plug power, 125
Portable applications, 126
Present worth, 135, 136
Profitability assessment of
  absorption air conditioning system, 145
  compression air conditioning system, 143
  PEM fuel cell, 142
  the systems, 141
Proton energy systems, 125
Proton exchange membrane fuel cell, 38
  fuel cells, 131, 133, 142, 148, 149, 153
  PEM, 38, 42, 103, 106, 110
  PEMFC, 27, 38–43, 45, 49
PTFE/Pt-black, 49

R

R134a/DMAC, 64
R23 + R32 + R134a/DMF, 64
Raldow, 88, 102
Redox
  electrochemical reactions, 121
  reactions, 25
Refrigerant-sorbent systems, 87
Refrigeration sorption machine, 79
Renewable energy, 123
Renewable fuels, 13
Residential, 9, 20
Rivera, 69, 72, 107, 109, 119
Roberson J.P., 89
Robur, 56, 58

Romero, 69, 72, 89, 102, 106, 111, 114, 119
Rotartica, 56, 58, 60
Rozière J., Jones D., 39, 53
Ruge M., Büchi F.N., 42, 53
Rush, 87, 88, 102

S

Sabir, 67, 72
Sadi Carnot, 76
Sanyo Electric Co., 56, 125
Saravanan and Maiya, 72
Scooters, 123
Sebastian, 119
Second law, 78
Selection of refrigerant, 86
Shuxing Wang, 130
Siemens Westinghouse Power Corp., 125
Sieres, 65, 72
Single-effect, 56, 59, 61, 67
Sodium thiocyanate in liquid ammonia, 89
Solar, 9
Solar next, 59, 61
Solid oxide fuel cell, 27
  SOFC, 27, 31, 38
Solubilization, 81
Solvation, 48
Sonnenklima, 56, 60
Sor Tech, 56
Sorption
  processes, 81
  refrigeration cycle, 82
  systems, 53, 55
  work fluids, 86
Sortech AG, 60, 61
Space missions, 126
SRC, 82, 83, 86
Srikhirin, 95, 102
Stages of development of society, 1
Standard conditions, 27, 34
Standard potential, 27
Stanley Angrist, 31, 36
Stationary
  applications, 123
  PAFC cogeneration system, 128
  power, 122
Sulfuric acid-water solutions, 88
Sun and Guo, 63
Sustainable development, 6

T

Tae Kang, 70, 72
Technical University of Ilmenau, 63
Technological challenges, 48
Teflon®, 39
Theoretical thermal effect, 85
Thermal efficiency, 34
Thermal machine, 76
Thermax, 56
Thermodynamic and electrochemistry principles, 25
Thermodynamic principles, 31, 75
Time value of money, 134
Total capital costs, 137
Toyota Motor Corporation, 125
Trane, 56
Transportation, 10
Trigeneration, 23, 117, 118
Trigeneration systems, 116
Tsuchiya and Kobayashi, 133, 154
TVM, 134
Two-stroke scooters, 125
Tyagi and Rao, 87

U

University of Stuttgart, 61
US Navy, 127
UTC, 50, 55

V

Valenzuela E., 41, 53
Vapor compression refrigeration cycle, 80
Venegas, 70, 72

W

Wagner, 63, 73
Wan, 67, 73
Warshay M., Prokopius P.R., 47, 53
Water/liCl, 69
Water/lithium bromide, 56, 57, 59, 60, 65, 69
Water/silicagel, 59
Water–Carrol, 112, 113, 119
Water–lithium bromide, 109
Weil, 89
Worek, 66, 73
Working capital costs, 137
Working substances, 88

World carbon dioxide emissions, 11
World primary energy production and consumption, 7

Y

Yaxiu, 62, 73
Yazaki, 56, 60
Yong & Wang, 102
Yoon, 65, 73
York, 56

Z

Zellhoeffer, 89, 102
Zetzsche, 62, 73
Zhang, 65, 73
Ziegler, 97
Zinc bromide, 89
Zoulias and Lymberopoulos, 133