<table>
<thead>
<tr>
<th>Page numbers followed by f and t indicate figures and tables, respectively.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abengoa Solar, 1-5</td>
</tr>
<tr>
<td><strong>ABT.</strong> See <strong>Availability Based Tariff (ABT)</strong></td>
</tr>
<tr>
<td>Access roads design, for wind plants, 8-17</td>
</tr>
<tr>
<td>Acid gas removal (AGR), 20-12</td>
</tr>
<tr>
<td>Acoustic noise. See also Aero-acoustic noise impacts on wind power systems, 8-9</td>
</tr>
<tr>
<td><strong>Acronyms</strong></td>
</tr>
<tr>
<td>advanced ultra supercritical (A-USC) coal fired generators, 17-20</td>
</tr>
<tr>
<td>bioenergy, 14-11</td>
</tr>
<tr>
<td>geothermal energy, 16-23</td>
</tr>
<tr>
<td>petroleum dependence and bioenergy, 19-36 to 19-37</td>
</tr>
<tr>
<td>tidal and wave power, 13-8</td>
</tr>
<tr>
<td>ACS-Cobra, 3-10</td>
</tr>
<tr>
<td><strong>Active solar space heating systems, 2-21</strong></td>
</tr>
<tr>
<td><strong>Active solar technologies</strong></td>
</tr>
<tr>
<td>concentrating solar power, 5-6 to 5-7</td>
</tr>
<tr>
<td>overview, 5-4</td>
</tr>
<tr>
<td>photovoltaic technology, 5-5</td>
</tr>
<tr>
<td>Adams, William, 5-1</td>
</tr>
<tr>
<td><strong>Adaptive management, 13-6f, 13-7</strong></td>
</tr>
<tr>
<td>Adsorption, 18-7</td>
</tr>
<tr>
<td>Advanced boiling water reactor (ABWR), 23-7</td>
</tr>
<tr>
<td>Advanced flat plate collectors, 2-23</td>
</tr>
<tr>
<td>Advanced heavy water reactor (AHWR), 23-7, 23-7f, 23-12</td>
</tr>
<tr>
<td>Advanced photovoltaic concepts, 6-10 to 6-11</td>
</tr>
<tr>
<td>Advanced photovoltaic solar array (APSA), 6-6</td>
</tr>
<tr>
<td>Advanced recycling center (ARC), 23-23</td>
</tr>
<tr>
<td><strong>Aero-acoustic noise</strong></td>
</tr>
<tr>
<td>generated by wind turbine, 7-9 to 7-10</td>
</tr>
<tr>
<td>Aerodynamic efficiency, 26-5f</td>
</tr>
<tr>
<td>Aerodynamics</td>
</tr>
<tr>
<td>role in wind turbine design, 7-11</td>
</tr>
<tr>
<td>Agricultural residues, 14-4</td>
</tr>
<tr>
<td>Agriculture in U.S., 19-19</td>
</tr>
<tr>
<td><strong>AID.</strong> See <strong>U.S. Agency for International Development (AID)</strong></td>
</tr>
<tr>
<td>Air</td>
</tr>
<tr>
<td>infiltration, 18-6</td>
</tr>
<tr>
<td>pollutants, 19-33</td>
</tr>
<tr>
<td>separation, 18-2, 18-6f, 18-7 to 18-8, 18-7f</td>
</tr>
<tr>
<td><strong>Air-conditioning systems, solar heating and cooling for active systems, 2-21</strong></td>
</tr>
<tr>
<td><strong>passive systems, 2-21</strong></td>
</tr>
<tr>
<td>PV/thermal hybrid systems, 2-22</td>
</tr>
<tr>
<td>solar absorption technology, 2-21 to 2-22</td>
</tr>
<tr>
<td>space heating, 2-21</td>
</tr>
<tr>
<td>Air Liquide, 18-7, 18-8f</td>
</tr>
<tr>
<td>Air versus water condenser cooling power tower systems, 2-3 to 2-5</td>
</tr>
<tr>
<td>Algae projects, 19-31</td>
</tr>
<tr>
<td><strong>ALSEP.</strong> See <strong>Apollo Lunar Surface Experiments Package (ALSEP)</strong></td>
</tr>
<tr>
<td>Alternative energy, source. See Waste material utilization</td>
</tr>
<tr>
<td>Aluminum oxide, 32-11</td>
</tr>
<tr>
<td>American Recovery and Reinvestment Act 2009 (ARRA), 8-6</td>
</tr>
<tr>
<td>American Society for Nondestructive Testing (ASNT), 25-2</td>
</tr>
<tr>
<td>American Society of Civil Engineers (ASCE), 11-13</td>
</tr>
<tr>
<td>American Society of Medical Engineers (ASME), 11-13</td>
</tr>
<tr>
<td>Ames Aeronautical Laboratory, 6-1</td>
</tr>
<tr>
<td>Ammonia catalyst, 10-15f, 20-15</td>
</tr>
<tr>
<td>Amonix, 1-10</td>
</tr>
<tr>
<td>Anaerobic digestion, use of, 15-14 to 15-15</td>
</tr>
<tr>
<td>Andasol-I &amp; Andasol-II, 3-9</td>
</tr>
<tr>
<td>Annual average wave power density, 13-2f</td>
</tr>
<tr>
<td>Annual average wave power (in west coast), 13-3f</td>
</tr>
<tr>
<td>Apollo Lunar Surface Experiments Package (ALSEP), 6-8</td>
</tr>
<tr>
<td>Appraisals (hydro power projects), in India</td>
</tr>
<tr>
<td>appraisal of DPRs, 12-11 to 12-12</td>
</tr>
<tr>
<td>aspects appraised by different agencies, 12-13 to 12-14</td>
</tr>
<tr>
<td>documents to be submitted for, 12-12 to 12-13</td>
</tr>
<tr>
<td>APSA. See <strong>Advanced Photovoltaic Solar Array (APSA)</strong></td>
</tr>
<tr>
<td>Areva (Palo Alto, California), 1-5</td>
</tr>
<tr>
<td>ARR. See <strong>American Recovery and Reinvestment Act 2009 (ARRA)</strong></td>
</tr>
<tr>
<td>ARUN160, 4-5, 4-8</td>
</tr>
<tr>
<td>ASCE. See <strong>American Society of Civil Engineers (ASCE)</strong></td>
</tr>
<tr>
<td>Ash removal system, 20-11</td>
</tr>
<tr>
<td>a-Si solar cells, 2-14, 2-15</td>
</tr>
<tr>
<td><strong>ASME.</strong> See <strong>American Society of Mechanical Engineers (ASME)</strong></td>
</tr>
<tr>
<td>ASME code philosophy, 21-4</td>
</tr>
<tr>
<td>ASME nuclear training seminars, 24-9</td>
</tr>
<tr>
<td><strong>ASTER satellite image, 16-7f</strong></td>
</tr>
<tr>
<td>Atomic Energy Act, 15-2</td>
</tr>
<tr>
<td>Auto shredder residue, 15-8 to 15-9</td>
</tr>
<tr>
<td>Availability based tariff (ABT), 10-3</td>
</tr>
<tr>
<td>Availability factor</td>
</tr>
<tr>
<td>turbine performance, 8-7</td>
</tr>
<tr>
<td>Availability of a power plant, 27-27 to 27-29</td>
</tr>
<tr>
<td>Babcock &amp; Wilcox Company (B&amp;W), overview of. See <strong>Carbon capture technologies</strong></td>
</tr>
<tr>
<td>Badische Anilin und Soda Fabrik (BASF), 20-13</td>
</tr>
<tr>
<td>Bailey, Sheila, Dr., 6-10, 6-11, 6-12</td>
</tr>
<tr>
<td>Bass Strait Island Energy Vision overview, 28-2</td>
</tr>
<tr>
<td>Batch heater (or ICS), 2-19</td>
</tr>
<tr>
<td>passive direct system, 2-19</td>
</tr>
<tr>
<td>Batteries for energy storage, 5-8</td>
</tr>
</tbody>
</table>
Building-integrated photovoltaics (BIPV) system

Bioenergy. See also Bioenergy.

Biodiesel fuel, 19-24 to 19-25, 19-24f, 19-25f

Binary-cycle power, 16-7 to 16-8, 16-8f, 16-9f

Bhutan, hydro-development in, 12-15

Bharat Heavy Electrical Limited (BHEL) in India, 20-5

Betz limit, 13-2

BES codes, 1-16

See Building energy simulation (BES)

Berkeley Seismological Laboratory (BSL), 16-17

Benson point load, 17-8

Bench-scale PCCC unit, 18-13, 18-13f

Becquerel, Edmund, 5-1

I-  •  INDEX

Biological oxygen demand (BOD), 8-10

Biofuels, 14-10 to 14-11

infrastructure and logistics of biomass, 14-4 to 14-5

biomass types/sources/supplies

biofuels, 14-10 to 14-11

Biomass fuels and feedstocks

biofuels, 14-10 to 14-11

Biomass

biomass types/sources/supplies

Biodiesel fuel, 19-24 to 19-25, 19-24f, 19-25f

Biomass properties

utilization, 19-17 to 19-18, 19-17f, 19-18f

demand/consumption, 19-21 to 19-22

biodiesel, energy values and, 19-24 to 19-25, 19-24f, 19-25f

BTUs and best value, 19-23 to 19-24

ethanol, energy values and, 19-24, 19-24f

price of carbon, 19-22 to 19-23, 19-22f, 19-23f

residential heat energy, 19-25 to 19-26, 19-25f, 19-29f

economics of, 19-16 to 19-17, 19-35 to 19-36

food vs fuel, 19-34 to 19-35, 19-34f

gasification, 14-10

infrastructure for, 19-19 to 19-20, 19-19f

data collection, 19-20 to 19-21

government administrative costs, 19-20

recycling, price impact of, 19-21

relative prices, 19-20

uncertainty and prices, 19-20

waste treatment, 19-21

non-energy materials, 19-32

payments/subsidies, 19-33 to 19-34

policy, benefits and costs of

U.S. environmental regulation, 19-32 to 19-33, 19-33t

pyrolysis and carbonization, 14-10

Renewable Fuels Standard regulations (RFS2), 19-35

technical innovation, 19-18 to 19-19, 19-19f

torrefaction, 14-10

Biofuels, 14-10 to 14-11

Biomass

boilers, small, 14-5 to 14-6, 14-6f

with coal, cofiring, 14-8 to 14-9

properties. See Biomass fuels and feedstocks

residuals, 19-32

supply. See Bioenergy

sustainability, 14-5

utilization, 19-17 to 19-18, 19-17f, 19-18f

Biomass fuels and feedstocks

biomass properties

density and energy density, 14-1, 14-2t

moisture, 14-1

particle size, 14-2

volatile ash, 14-2, 14-3f, 14-3t

volatile content, 14-1 to 14-2, 14-2t

biodiesel, energy values and, 19-24 to 19-25, 19-24f

Brazilian environment, 5-1

Branding, 17-6

Brassaudeau,矢野, 18-3

Breadys power plant in Nevada, 16-8, 16-9f

Braking losses, 26-7

Brayton cycle, 27-3 to 27-5

evaporative and fogging systems, 27-5 to 27-6

inlet cooling effect, 27-5

intercooled regenerative reheat cycle, 27-9

intercooling and reheat effects, 27-6 to 27-7

mid-compressor flashing of water, 27-7 to 27-8

refrigeration systems, 27-6

regeneration effect, 27-8

reheat effect, 27-8 to 27-9

Brayton-Rankine cycle, 27-11 to 27-13

British Thermal Unit (BTU), 15-4, 19-23 to 19-24

Brush, Charles F., 7-1

Brush seal, 26-19f

BTU. See British Thermal Unit (BTU)

Building energy simulation (BES), 1-16

Building-integrated photovoltaics (BIPV) system, 1-18 to 1-19

roof-mounted, 2-15 to 2-16

Buildings

applications of solar energy

BES codes, 1-16

desiccant dehumidification/cooling system, 1-19

net zero energy buildings, 1-16 to 1-17

overview, 1-16

photovoltaic applications, 1-18 to 1-19

solar building space cooling, 1-19

solar domestic water heating systems, 1-17 to 1-18

solar lighting, 1-19

distributed photovoltaic systems for integration issue, 2-16 to 2-17

large- vs. small-scale PV systems, 2-18

non-roof-mounted systems, 2-16

overview, 2-12

roof-mounted BIPV systems, 2-15 to 2-16

system components, 2-13 to 2-15

solar thermal systems for

overview, 2-18

solar heating and cooling for air-conditioning systems, 2-21 to 2-22

solar water heating systems, 2-18 to 2-21

Buried piping, 22-3 to 22-4, 22-3f, 22-4f

Callide power plant (Australia), 15-8

Capacity factor

turbine performance, 8-7

Cape Canaveral Auxiliary Air Force Station, 6-1

Capital costs, 13-5, 13-6t

Carbon, price of, 19-22 to 19-23, 19-22f
Carbon capture and sequestration (CCS), 17-2, 17-5
Carbon capture technologies
outlines of, 18-1 to 18-2, 18-2f
oxy-combustion
air separation, 18-6f, 18-7 to 18-8, 18-7f
commercial plant, 18-8, 18-9f
comparative study, 18-8 to 18-9, 18-9f
demonstration plant, 18-8, 18-8f
design considerations, 18-4 to 18-6, 18-4f, 18-5f
partial capture and swing operation, 18-9
power block equipment options, 18-6 to 18-7
process description, 18-2 to 18-3, 18-2f
retrofit potential for, 18-9 to 18-10
state of development, 18-3 to 18-4, 18-3f
PCC technology. See Post-combustion carbon capture
Carbon dioxide
absorber system, 18-10 to 18-11
emissions, 16-15, 16-16f
reduction, 17-5 to 17-6, 17-6f
purification and compression, 18-6f, 18-7 to 18-8
stream conditioning, 18-11
Carbon financial instrument (CFI), 19-23
Carbonization, 14-10
Carbon monoxide (CO), 27-16 to 27-17
Carbon trust, 13-2
Chemical degradation, 18-15
Chemical and fuel properties of fuels, 20-2t
Chemical geothermometers, 16-6
Chemical industry, 15-5
Chemical looping, 18-7
Chemical looping theory, 20-2 to 20-3
Chemical looping technology, 20-3 to 20-4, 20-3f, 20-4f
Chemical looping technology, moving bed, 20-3 to 20-4, 20-4f
Chemical looping technology, fluidized bed, 20-4 to 20-6, 20-5f, 20-6f
Chemical looping technology, entrained flow, 20-6 to 20-10, 20-6f, 20-7f, 20-8f, 20-9f, 20-10f
Chemical looping technology, pressurized circulating fluidized bed (PCFB), 20-10
Chemical looping technology, integrated gasification combined cycle (IGCC), 20-3 to 20-4, 20-4f
Chemical looping technology, oxy-fuel combustion, 20-4 to 20-6, 20-5f, 20-6f
Chemical looping technology, gas turbine, 20-6 to 20-10, 20-6f, 20-7f, 20-8f, 20-9f, 20-10f
Chemical looping technology, fluidized bed gasifiers, 20-4 to 20-6, 20-5f, 20-6f
Chemical looping technology, entrained flow gasifiers, 20-6 to 20-10, 20-6f, 20-7f, 20-8f, 20-9f, 20-10f
Coal fired generators, advanced ultra supercritical (A-USC)
boiler fuel efficiency, 17-3
CO₂ emissions reduction, 17-5 to 17-6, 17-6f
commercial plants, 17-18 to 17-19
COMTEST1400 project, 17-17 to 17-18, 17-18f
convection pass enclosure, 17-13
convection pass heating surface, 17-13 to 17-14
cost of electricity, 17-16
design codes
by ASME formula, 17-15
materials selection, 17-15, 17-15t, 17-16f
double reheat cycle, 17-4
economical evaluation, 17-16 to 17-17, 17-17f
examples of, 17-6, 17-7f
fabrication methods, 17-15
failure mechanisms
fireside coal ash corrosion, 17-14 to 17-15
mechanical properties, 17-14
steam side oxidation, 17-14
furnace enclosure, 17-7f, 17-12 to 17-13, 17-12f
furnace roof, 17-13
materials development, 17-14
material supply chain, 17-15 to 17-16
net plant efficiency, 17-2
operational design, 17-6 to 17-12, 17-9, 17-10, 17-11t
outlines of, 17-1 to 17-2, 17-2f
and turbine cycle description, 17-4 to 17-5, 17-5f
turbine heat balance, 17-4 to 17-5, 17-5f
turbine throttle pressure selection, 17-3 to 17-4, 17-4f
Coal-fired utility power generation. See Carbon capture technologies
Coal gasification
applications of
hydrogen and ammonia, 10-15f, 20-15
liquid fuels, 10-14f, 20-13 to 20-14
power generation, 20-12 to 20-13, 20-12f, 20-13f
synthetic natural gas (SNG), 20-14 to 20-15, 20-14f
design and cost, 20-10 to 20-12, 20-11f, 20-11t
outlines of, 20-1 to 20-2, 20-1f, 20-1t, 20-2t
outlook for
carbon to chemicals, 20-20 to 20-21, 20-20t
carbon to electricity, 20-18 to 20-20, 20-19f, 20-19t
carbon to liquids, 20-16 to 20-18, 20-17f, 20-18t
carbon to ammonia, 20-18
consumption pattern, 20-16, 20-16f
global energy consumption pattern, 20-15 to 20-16
growth market identification, 20-16, 20-16f
theory, 20-2 to 20-3
entrained flow gasifiers, 20-6 to 20-10, 20-6f, 20-7f, 20-8f, 20-9f, 20-10f
fluidized bed gasifiers, 20-4 to 20-6, 20-5f, 20-6f
moving bed technology, 20-3 to 20-4, 20-3f, 20-4f
Coal supplies, worldwide, 18-2
Coal to chemicals technology, 20-20 to 20-21, 20-20t
Coal to electricity technology, 20-18 to 20-20, 20-19f, 20-19t
Coal to liquids technology, 20-16 to 20-18, 20-17f, 20-18t
Coal to SNG technology, 20-18
Coating materials selection, 32-10 to 32-11
aluminum oxide, 32-11
carbon nanotubes, 32-11 to 32-12
carbon nanotubes, 32-12
carbon nanotubes, 32-13
carbon nanotubes, 32-11
carbon nanotubes, 32-12
carbon nanotubes, 32-13
carbon nanotubes, 32-11
carbon nanotubes, 32-12
carbon nanotubes, 32-13
carbon nanotubes, 32-11
Cofiring (biomass with coal), 14-8 to 14-10
Cogeneration, 27-3
Coherent, semi-coherent, incoherent interfaces, 32-10
Collectors. See Solar collectors
Combined cycle plants, 27-26 to 27-27
Combined cycle power plants, 27-1 to 27-3 components of, 27-13 to 27-14
Combined solar power and heat system, 2-12
Combustion. See Heat and power generation
Commercial plant, 18-8, 18-9f, 18-14 to 18-16
Commercial sector in petroleum consumption, 19-5 to 19-7, 19-6f to 19-7f
Compound parabolic concentrator collectors, 2-24 to 2-25
Compressed air
for energy storage, 5-9
Compression purification unit (CPU), 17-6
CO₂, 18-2, 18-8
Computers in nuclear power plant construction, 21-7
COMTEST1400 project, 17-17 to 17-18, 17-18f
Concentrated animal feed operations (CAFO), 14-4
Concentrating collectors with stationary reflector (CCStaR), 2-25 to 2-26
Concentrating photovoltaic (CPV) systems, 1-8 to 1-9, 5-6 to 5-7. See also Photovoltaic (PV) systems benefits of, 1-9 high concentration PV (HCPV) systems, 1-9 to 1-10 low concentration PV systems, 1-10 to 1-11 tradeoffs between one-sun, low concentration, and high concentration systems, 1-11 to 1-12 vs. fixed flat plate systems, 1-9, 1-11 to 1-12 Concentration, use of, 1-1 to 1-2 Condensate depression, 30-4, 30-6 to 30-7 Condenser design considerations, 30-1 to 30-2 Condenser pressure, 30-4 Condensing steam temperature, 30-4 Conservation, 1-16, 3-3, 8-8, 9-7, 10-12, 12-13, 12-14, 12-21, 13-1, 13-10, 15-2, 19-3, 19-4, 19-19, 19-32, 19-33, 19-37, 20-16, 24-2, 24-10, 31-14, 31-15 Construction and demolition debris (C&D debris), 15-7 Construction cost of power plant (in U.S.), 16-13t Consumer price indices for food and energy, 19-34f Controller-based active direct systems, 2-19 to 2-20 Controlling Wind program, 9-6 Convection pass enclosure, 17-13 Convection pass heating surface, 17-13 to 17-14 Conversion technology project scale, 19-27 to 19-28 Cooking systems, solar thermal in India, 4-2 to 4-3 Corrosion, system, 18-15 to 18-16 Cost reduction potential large-scale solar energy plants, 2-12 Costs of energy, 13-5, 13-6t CPV systems. See Concentrating photovoltaic (CPV) systems Cryogenic separation, 18-7 CSMRS. See Central Soil and Material Research Station (CSMRS)
Curts, Henry, 6-10
CWC. See Central Water Commission (CWC)
Cyber security, 24-8
Cyclic loading, 21-7 to 21-8
Damping, aerodynamic, 26-17f
Data analysis
wind resources assessment, 8-14 to 8-16
Days import coverage, 19-2, 19-2f
Deep saline reservoirs, 18-1
Deep Space 1, 6-6, 6-7
Degree of reaction (R) in an axial-flow turbine, 27-23
Delft University of Technology (DUT), 8-1, 9-10 experimental facilities, 9-13
wind tunnels at, 9-13 to 9-14
DELSOL3, 3-14
Denmark, electricity generation in, 24-2
Department of Energy (DOE), 17-2
20% by 2030 scenario report, 7-9
Desalination systems, photovoltaic-driven, 2-26 to 2-27
Desiccant dehumidification/cooling system, 1-19 Design Point abnormal deviations from, 29-7 conditions, 29-6 effect of design point on configuration, 29-7 normal deviations from, 29-7 DE systems. See Dish/engine systems (DE) Direct air-space heating, 2-21 Direct-flow evacuated tube collector, 2-19 Direct gain, 2-21 Direct use system geothermal water for, 16-22 of hot water, 16-5 Dirty fuels, 20-2 Dish/engine systems (DE), 3-4, 3-5 Dish stirling systems, 1-5, 1-7 developments, 3-21 parabolic, 2-8 to 2-9 R&D in, 3-23 subsystems and components, 3-19 to 3-21 Disk rim blade attachment dovetails, 25-13 to 25-17, 25-13f, 25-14f, 25-15f, 25-16f Dispersoids, 23-27 Distributed photovoltaic systems, for buildings integration issue, 2-16 to 2-17 large- vs. small-scale PV systems, 2-18 non-roof-mounted systems, 2-16 overview, 2-12 roof-mounted BIPV systems, 2-15 to 2-16 system components, 2-13 to 2-15 District energy, 14-5 DOE. See Department of Energy (DOE)
Domestic heat, 14-5 Double reheat cycle, 17-4
DOEWE. See Dutch Offshore Wind Energy Converter project (DOEWE) Drag losses, 26-7 Drainback active indirect system, 2-19 Droplet impact velocity, 26-9f Dry low NOₓ combustor, 27-17 Dry steam, 16-7, 16-8f
DU airfoil data, 9-8 DUT. See Delft University of Technology (DUT)
Dutch Offshore Wind Energy Converter project (DOEWE), 9-4 DUWIND program, 9-10, 9-13 Dynamic control theory, 11-6 to 11-7 EAGLE gasifier, 20-9 Echo 1, 6-2 ECN. See Energy research Centre of the Netherlands (ECN) ECN scale wind farm, 9-12 to 9-13 Ecological effects assessment, 13-7 to 13-8 Economic Research Service (ERS), 19-17, 19-18 Economic shocks in U.S., 19-18t Economizer, 27-20 ED. See Electrodes (ED) process Eddy current testing, 25-3 E-Gas technology, 20-8 EIA. See Energy Information Administration (EIA) Electrical collection system, 8-17 to 8-19 Electrical power generation. See under Geothermal energy Electricity, cost of, 17-16
Energy Information Agency (EIA), 14-3
Energy efficiency, improving, 31-7 to 31-8
through improved product design: case study in injection molding
computing total energy consumption, 31-10 to 31-11
estimation of cycle times, 31-9 to 31-10
estimation of setup operations, 31-10
selection of machine, 31-8 to 31-9
Energy generation and conversion with emerging technologies
Energy Information Agency (EIA), 5-9 to 5-10, 5-11, 15-18
End use of energy, 19-12 to 19-13, 19-12f, 19-13f, 19-14f
Energy consumption, reduced
a case study AT Harbec Plastics, Inc, 31-11
Energy density, 14-1
Energy efficiency, improving, 31-7 to 31-8
through improved product design: case study in injection molding
computing total energy consumption, 31-10 to 31-11
estimation of cycle times, 31-9 to 31-10
estimation of setup operations, 31-10
selection of machine, 31-8 to 31-9
Energy generation and conversion with emerging technologies
a case study in use of supercritical fluids at Thar technologies
ethanol extraction, 31-12
food and fuel: biodiesel with a food-production bonus, 31-11 to 31-12
heating and cooling using a natural refrigerant, 31-12 to 31-13
miniature refrigeration systems, 31-13
power generation using the CO2 Brayton cycle, 31-13 to 31-14
Energy Independence and Security Act (EISA), 19-20, 19-33
Energy Information Administration (EIA), 5-9 to 5-10, 5-11, 15-18, 19-17
Energy Information Agency (EIA), 14-3
Energy management practices, best practices, regulations and standards, 31-14
Energy payback time, for wind turbine, 8-7
Energy prices (U.S.), 15-4t
Energy recovery. See under Waste material utilization
Energy Research and Development Administration (ERDA) interaction between NASA and, 6-3
Energy Research Centre of the Netherlands (ECN), 9-1, 9-2, 9-8 to 9-10
aerodynamic research, 9-8 to 9-9
design tools development, 9-9
ECN scale wind farm, 9-12 to 9-13
integrated wind turbine design research, 9-9
research in electrical systems and components, 9-10
wind turbine test site Wieringermeer, 9-11 to 9-12
Energy simulation model (ESM), benefits, 28-13 to 28-14
diesel fuel use, 28-16
modeling control philosophy, 28-14
diesel-UPS method, 28-16
instantaneous wind penetration method, 28-15
resistor method, 28-15 to 28-16
modeling results, 28-17 to 28-18
performance of system modeling, 28-18
scheduling order of preference, 28-16 to 28-17
simulation modules
diesel, 28-14
solar, 28-14
storage, 28-14
wind, 28-14
spill distribution and storage balance, 28-17
Energy storage batteries, 5-8
classes of, 2-11
compressed air, 5-9
flywheel energy storage systems, 5-8 to 5-9
hydropower for, 11-8 to 11-9
issues related to, 2-11
need for, 5-7 to 5-8
with renewable electricity generation, 2-11
superconducting magnetic energy storage, 5-9
water energy storage, 5-9
Energy values
and biodiesel, 19-24 to 19-25, 19-24f, 19-25f
by density for fuels, 19-26f
and ethanol, 19-24, 19-24f
and residential heat, 19-25 to 19-26, 19-25f, 19-29f
of waste, 15-4 to 15-5, 15-4f
Enhanced engineered geothermal systems (EGS), 16-9 to 16-10, 16-13f, 16-14f
Enhanced geothermal systems, 16-4 to 16-5
Enhanced oil recovery (EOR), 18-1
Entrained flow gasifiers, 20-6 to 20-10, 20-6f, 20-7f, 20-8f, 20-9f, 20-10f
Environmental Protection Agency (EPA), 15-2, 15-3
Environment related issues
wind energy and, 8-8
EPRI. See Electric Power Research Institute (EPRI)
Erosion protection, 26-18
Essom, 2-1
Essential Macleod, 2-6
ETDD program. See Enabling Technology Development and Demonstration (ETDD) program
Ethanol
demand, 19-19
energy values and, 19-24, 19-24f
industry, 19-19
Evacuated tube collector, 2-18 to 2-19, 5-3
for manufacturing, 2-23 to 2-24
Exciters, 11-8
Exhaust pressure limitations, 26-24f
Exploration Precursor Robotic Missions (xPRM), 6-14
Export dependence of petroleum, 19-2 to 19-3, 19-3f
Fast breeder test reactor (FBTR), 23-11
Fenton Hill experiment, 16-9
Filtration, 18-16
Finite elements program, 21-7
Fixed flat plate systems
vs. CPV systems, 1-9, 1-11 to 1-12
Flagship Technology Demonstration Program, 6-14
Flash steam, 16-7, 16-8f
Flat-plate collector (glazed/un glazed), 2-18, 5-3
advanced, 2-23
FlexHat program, 9-3
Flow accelerated corrosion of carbon steel piping, 22-2f, 22-1 to 22-2
Flue gas desulfurization (FGD), 18-15
Flue gas pre-scrubbing, 18-15
Flue gas recycle, 17-6
Flue gas system, 18-15
Flue gas pre-scrubbing, 18-15
Flue gas desulfurization (FGD), 18-15
Flywheel energy storage systems, 5-8 to 5-9
forced circulation characteristic (FCC), 17-13
Forecasting
in wind energy research, 8-20 to 8-21
Forest residues, 14-4
Fossil fuel costs, 16-21
Fourneryon, Benoit, 11-1
Fracture appearance transition temperature (FATT), 26-22
Francis, James B., 11-1
Francis turbine, 11-3 to 11-5
“Fresh Look” study, 6-15
Fresnel (line focus) solar thermal plant, 1-5
Fresnel reflectors, 3-4, 5-6
Fritts, Charles, 5-1
Fuel, heating value of, 14-1
Fuel cells
- types, 1-14
- use for vehicular propulsion, 1-14 to 1-15
Fuel cell technologies, 32-4
Fuel pellet industry, 19-32
Fuel use, ultimate, 19-13 to 19-14
Fuller, Calvin, 5-1
Furnace enclosure, 17-7f, 17-12 to 17-13, 17-12f
Furnace exit gas temperature (FEGT), 17-11
Furnace roof, 17-13
Gaddy, Edward, Dr., 6-10
Gas-cooled fast reactor (GFR), 23-20 to 23-21
Gas-cooled reactors, 23-5 to 23-6
Gaseous emissions, 16-17
Gasification, 14-10, 15-9, 15-14 to 15-15
Gas recirculation (GR), 17-6
Gas Technology Institute, 20-5
Gas-to-Liquids (GTL) technology, 20-13
Gas turbine
- air pollution problems, 27-16 to 27-17
- blade material, 27-19
- coatings, 27-19
- combustors, 27-16
- compressor section, 27-14 to 27-16
- cooling schemes, 27-19
- turbine expander section, 27-17 to 27-19
Gas turbine HRSG systems, 27-19 to 27-20
approach temperature, 27-20 to 27-21
attemperators, 27-21
deaerator, 27-21
design considerations
- back-pressure considerations (gas side), 27-22
- forced circulation system, 27-21
- supplementary firing of HRSG systems, 27-22 to 27-23
desuperheaters (DSH), 27-21
economizers, 27-21
evaporators, 27-21
multi-pressure steam generators, 27-20
once through steam generators (OTSG), 27-20
pinch point, 27-20
selective catalytic reduction (SCR) system, 27-21
GateCycle software, 2-3, 2-4
GBI. See Generation-based incentive (GBI)
GE energy, 20-7, 20-8f
Generation-based incentive (GBI), 10-5
Generator rotors. See under Steam turbine and generator inspection
Geological Survey of India (GSI)
- aspects appraised by, 12-14
- Geopolitics, 19-14 to 19-15, 19-14f, 19-15f
- Geopressured systems, 16-5
Geothermal energy
- comparative study, 16-20
- developments in U.S., 16-8 to 16-9, 16-11f, 16-12f
- direct use of, 16-22, 16-22f
- electrical power generation, 16-6
- binary-cycle power, 16-7 to 16-8, 16-8f, 16-9f
- dry steam, 16-7, 16-8f
- flash steam, 16-7, 16-8f
- in energy markets
- fossil fuel costs, 16-21
- production tax credits (PTC), Federal, 16-20
- renewable energy portfolio standards, 16-20, 16-21t
- enhanced/engineered geothermal systems (EGS), 16-9 to 16-10, 16-13f, 16-14f
- environmental benefits, 16-14f, 16-15, 16-15f, 16-16f
- geothermal heat pumps (GHP), 16-22 to 16-23, 16-23f
- literature on, survey of, 16-3 to 16-4
- outlines of, 16-1 to 16-3, 16-3f, 16-4f
- potential environmental impacts, 16-16
- gaseous emissions, 16-17
- habitat and vegetation, disturbance of, 16-17
- hydrothermal explosions, 16-20
- induced boiling, 16-20
- landslides, 16-19, 16-19f
- land subsidence, 16-17, 16-17f
- natural hydrothermal features, disturbance of, 16-18 to 16-19
- reservoir drawdown, 16-17
- seismicity, induced, 16-17 to 16-18, 16-18f
- water pollution, 16-17
- water use, 16-18
- power production, 16-11 to 16-15, 16-13t
- in world, 16-2, 16-3f
- production systems
- direct use system, 16-5
- enhanced geothermal systems, 16-4 to 16-5
- geopressed systems, 16-5
- geothermal heat pumps (GHP), 16-5
- magmatic systems, 16-5
- natural hydrothermal systems, 16-4
- resource development, 16-5 to 16-6, 16-7f
- sustainability, 16-21 to 16-21
- utility impact on, 16-10 to 16-11
Geothermal heat pumps (GHP), 16-5, 16-22 to 16-23, 16-23f
German–Dutch wind tunnels at DNW, 9-14
Glaser, Peter, Dr., 6-15
Global energy consumption pattern, 20-15 to 20-16
Global usage, of hydropower, 11-13 to 11-14
Glycol active indirect system, pressurized, 2-20, 2-21
Goddard Space Flight Center (GSFC), 6-1, 6-10
Governor, hydroelectric. See Hydroelectric governors
Graphite fuel, 23-28f
Graphitization, 22-3
Grate boilers in Denmark, 14-6f
Greenhouse gas (GHG) emissions, 16-15, 19-35
Green pricing programs, 8-6 to 8-7
Grid connected PV systems
- in India, 4-1, 4-2
- Grid integration, in wind energy operations, 8-19 to 8-22
- forecasting, 8-20 to 8-21
- hybrid energy systems, 8-21 to 8-22
- storage, 8-21
Grid operations
- with wind power, 8-7 to 8-8
GSI. See Geological Survey of India (GSI)
Habitat and vegetation, disturbance of, 16-17
Hard coatings for improved wear resistance, 32-7 to 32-8
HAWT. See Horizontal axis wind turbines (HAWT), SNL’s
Hazardous air pollutant (HAP), 15-4
HCPV systems. See High concentration photovoltaic (HCPV) systems
Heat and power generation
- combustion
- biomass boilers, small, 14-5 to 14-6, 14-6f
- district energy, 14-5
- domestic heat, 14-5
- fluidized bed boilers, 14-8, 14-8f
- industrial boilers, small, 14-7
Hydrokinetic turbine, 13-7
Hydrokinetic Pilot Project criteria, 13-7
Hydrogen synthesis, 10-15f, 20-15
Hydrogen sulfide (H2S) emissions, 16-17
Hydrogen
Hydroelectric governors, 11-5 to 11-6
Hydroelectric generators, 11-5 to 11-6
Hydroelectric controls, 11-6 to 11-8
Hydrodynamic subsystem, 13-4
Hydraulic power of seawater, 13-3f
Hydraulic power density, 13-2
Hybrid energy systems (HES), 8-21 to 8-22
Heat transfer fluid (HTF)
See HTF.
Hot springs, 16-1
Hot springs, 16-1
Hot springs, 16-1
Hot springs, 16-1
Hot springs, 16-1
Hot springs, 16-1
Hot springs, 16-1
Hot dry rock (HDR), 16-9
Hot springs, 16-1
HTF. See Heat transfer fluid (HTF)
Hybrid energy systems (HES), 8-21 to 8-22
Hydraulic power density, 13-2
Hydraulic power of seawater, 13-3f
Hydrodynamic subsystem, 13-4
Hydroelectric controls, 11-6 to 11-8
types, 11-7 to 11-8
Hydroelectric generators, 11-5 to 11-6
Hydroelectric governors, 11-6 to 11-8
Hydrogen
background, 1-12
characteristics, 1-12
generation of, 1-12 to 1-13
production, solar chemical reactors for, 2-27 to 2-28
utilization of, 1-13 to 1-16
Hydrogen sulfide (H2S) emissions, 16-17
Hydrogen synthesis, 10-15f, 20-15
Hydrokinetic Pilot Project criteria, 13-7
Hydrokinetic turbine
types, 11-9 to 11-10
Hydro Policy, 12-3
Hydro potential, 12-4
Hydropower generation
challenges in, 12-18
constraints in, 12-17 to 12-18
for energy storage, 11-8 to 11-9
energy trends, 11-14
equipments
exciters, 11-8
Francis turbine, 11-3 to 11-5
hydroelectric controls, 11-6 to 11-8
hydroelectric generators, 11-5 to 11-6
Kaplan turbine, 11-5
Pelton turbine, 11-5
pump turbine, 11-5
future prospects, 11-14, 12-18 to 12-19
history of, 11-1 to 11-2
United States, 11-2 to 11-3
in India
acceleration of development, 12-6 to 12-7
appraisal and technoeconomic clearances, 12-11 to 12-15
climate change impacts, 12-3
cconducting policies, 12-3
constitutional provisions of water and power resources, 12-11
development of, 12-4 to 12-6
economic and social advantages, 12-2
efficiency, flexibility and reliability, 12-3
energy scenario, 12-2
hydro potential, 12-4
installed capacity and share of hydro, 12-2
national level resolve, 12-3 to 12-4
overview and historical perspectives, 12-1
per capita power consumption, 12-2
pumped storage developments, 12-9 to 12-10
regulatory agencies, 12-11
resettlement and rehabilitation policies, 12-11
role of hydro, 12-2 to 12-3
small hydro development, 12-7 to 12-9
strategy for hydro development during 12th Plan period (2012 to 2017), 12-7
synergy with other renewable energies, 12-2 to 12-3
transmission, set-up, and status, 12-10 to 12-11
issues related to, 12-16 to 12-17
in neighbouring countries, 12-15
ocean and kinetic energy
hydrokinetic turbine types, 11-9 to 11-10
wave energy converters, 11-10 to 11-13
organizations, 11-13
overview, 11-1
owners, 11-13
Renewable Portfolio Standard (RPS), 11-14
response and achievement of private sector, 12-15 to 12-16
worldwide usage, 11-13 to 11-14
Hydro Tasmania. See also King Island
overview, 28-1 to 28-2
Hydrothermal explosions, 16-20
ICE. See Internal combustion engine (ICE)
ICOLD. See International Committee on Large Dams (ICOLD)
ICS system. See Integrated collector storage (ICS) system
IEA. See International Energy Agency (IEA)
IEC. See International Electro-technical Committee (IEC)
IEEE. See Institute of Electric and Electronics Engineers (IEEE)
Imaging optics
vs. non-imaging optics, 1-2
IMD. See Indian Meteorological Department (IMD)
Independent Power Producers (IPPs), 10-2
Indian Renewable Energy Development Agency (IREDA), 10-4
Indian Meteorological Department (IMD), 4-1, 10-7
India
Irradiation-induced damage mechanisms, 23-26t
India hydropower generation in
acceleration of development, 12-6 to 12-7
appraisal and technoeconomic clearances, 12-11 to 12-15
climate change impacts, 12-3
creating policies, 12-3
constitutional provisions of water and power resources, 12-11
development of, 12-4 to 12-6
economic and social advantages, 12-2
efficiency, flexibility and reliability, 12-3
energy scenario, 12-2
hydro potential, 12-4
installed capacity and share of hydro, 12-2
national level resolve, 12-3 to 12-4
overview and historical perspectives, 12-1
per capita power consumption, 12-2
pumped storage developments, 12-9 to 12-10
regulatory agencies, 12-11
resettlement and rehabilitation policies, 12-11
role of hydro, 12-2 to 12-3
small hydro development, 12-7 to 12-9
strategy for hydro development during 12th Plan period (2012 to 2017), 12-7
synergy with other renewable energies, 12-2 to 12-3
transmission, set-up, and status, 12-10 to 12-11
solar energy applications in
average annual daily insolation for, 4-1, 4-2
cumulative deployment of PV modules in, 4-1, 4-3
deployment and certification, 10-9 to 10-10
energy end-uses, 4-1, 4-3
grid connected PV systems, 4-1, 4-2
industrial development, 4-1
isolation of solar PV power plants in, 4-5
parameters, 4-1
share of power generation installed capacity, 4-1, 4-2
solar lighting and home systems, 4-6
solar mission and future of solar in, 4-6 to 4-8
solar thermal cooking systems, 4-2 to 4-3
solar thermal hot water systems, 4-3 to 4-4
solar thermal power generation, 4-5 to 4-6
solar thermal systems for industries, 4-4 to 4-5
status and trends, 4-1
village electrification using solar PV, 4-2
wind energy technology in
design of wind turbines, 10-10 to 10-11
electricity generation, distribution and management, 10-1 to 10-3
growth of wind turbine field, 10-6 to 10-7
new RE-based incentives, 10-4 to 10-6
policy support, 10-4
technology deployment and certification, 10-9 to 10-10
wind resource, 10-7 to 10-9
Indian Meteorological Department (IMD), 4-1, 10-7
Indian Renewable Energy Development Agency (IREDA), 10-4
Indirect gain, 2-21
Induced boiling, 16-20
"Induction generators," 11-5 to 11-6
Industrial boilers, small, 14-7
Industrial enterprises
determining energy consumption, 31-5 to 31-7
efficient manufacturing, 31-3 to 31-4
overview, 31-1 to 31-2
unit manufacturing processes, 31-4
categorization of, 31-4 to 31-5
Industrial petroleum consumption, 19-7 to 19-8, 19-7f, 19-8f
Industry(ies)
in India
developmental aspects, 4-1
thermal systems for, 4-4 to 4-5
wind energy generation, 7-8 to 7-14
advanced architecture, 7-13
advanced control strategies, 7-12
aeroacoustics, 7-9 to 7-10
daeroacoustics, 7-11
design tools, 7-14
DOEs 20% by 2030 Scenario, 7-9
revitalizing U.S. clean manufacturing, 7-13
sensors and condition health monitoring, 7-11 to 7-12
testing and evaluation, 7-13 to 7-14
Initial temperature difference, 30-4
Installed capacity and share of hydro, in India, 12-2
Institute of Electric and Electronics Engineers (IEEE), 11-13
Integrated collector storage (ICS) system, 1-17
Integrated energy parks, 24-10
Integrated gasification combined cycle (IGCC), 20-1
Integrated solar combined cycle system (ISCCS), 3-9
Intergranular stress corrosion cracking (IGSCC), 22-2, 25-10
Internal combustion engine (ICE), 1-13
International Committee on Large Dams (ICOLD), 11-13
International Electro-technical Committee (IEC), 11-13
International Energy Agency (IEA), 3-1, 18-1, 18-2f
International Hydropower Association, 15-1
International Space Station (ISS), 6-7
IPPs. See Independent Power Producers (IPPs)
IREDA. See Indian Renewable Energy Development Agency (IREDA)
Irradiation-induced damage mechanisms, 23-26t
JSF. See Japan sodium-cooled fast reactor (JSFR)
Joseph Stalin Solar Mission (JNSM)
Junction Space Center (JSC)
Johnson Space Center (JSC), 6-1
JONU II project, 9-3 to 9-4
JSC. See Johnson Space Center (JSC)
Kaplan turbine, 11-5
Kennedy Space Center (KSC), 6-1
Kinetic energy, ocean and
hydrokinetic turbine types, 11-9 to 11-10
wave energy converters, 11-10 to 11-13
King Island
overview, 28-2
King Island power system overview
current asset configuration, 28-8
diesel generation, 28-8 to 28-9
dynamic resistive frequency controller, 28-10 to 28-11
frequency control, 28-9
Huxley Hill Wind Farm, 28-9
power station system controller, 28-8
solar, 28-10
vanadium redox battery, 28-9 to 28-10
Currie Power Station, 28-6 to 28-7
distribution system, 28-7
load profile, 28-7
power station development, 28-7 to 28-8
King Island proposed developments. See King Island Renewable Energy Integration Project (KIREIP)
King Island Renewable Energy Integration Project (KIREIP), 28-2 to 28-3, 28-18 to 28-19
biodiesel, 28-19 to 28-20
Diesel Uninterruptible Power Support (D-UPS) project, 28-20 to 28-21
graphite energy storage (thermal storage), 28-21 to 28-22
King Island Centre for Renewable Energy Excellence — KICREE, 28-22 to 28-23
Smart Grid, 28-22
Japan sodium-cooled fast reactor (JSFR), 23-8 to 23-10, 23-9f, 23-10t
Jawaharlal Nehru Solar Mission (JNSM)
Jet Propulsion Laboratory (JPL), 6-1, 6-3, 6-6, 6-10
JNSM. See Jawaharlal Nehru Solar Mission (JNSM)
Johnson Space Center (JSC), 6-1
JOULE II project, 9-3 to 9-4
JSC. See Johnson Space Center (JSC)
KINDEL, 11-8
KINDEL Centre for Renewable Energy Excellence — KICREE, 11-10
King Island Centre for Renewable Energy Excellence — KICREE, 28-22 to 28-23
Nuclear proliferation, 24-4
Nuclear turbine, 26-14f
NVVN. See NTPC Vidut Vyapar Nigam Ltd. (NVVN)

Ocean and kinetic energy
hydrokinetic turbine types, 11-9 to 11-10
wave energy converters, 11-10 to 11-13
Off-grid power system development, 28-3 to 28-6
Offshore Wind Farm Egmond aan Zee (OWEZ)
Offshore wind farm ‘Princes Amalia Windpark,’ 9-14 to 9-15
Offshore wind installations, 7-16 to 7-18
Ohio Coal Development Office (OCDO), 17-2
Oil export, 19-2 to 19-3, 19-3f
OPEC. See Organization of Petroleum Exporting Countries (OPEC)
Optical durability
power tower systems, 2-5 to 2-6
Optimized multiple-lead ribbed (OMLR) tubes, 17-13
Orchard pruning, 14-4
Organic Rankine cycle (ORC), 14-6, 16-8, 16-14. See also Rankine Cycle
Organization for Economic Cooperation and Development (OECD), 20-16
Organization of Petroleum Exporting Countries (OPEC), 6-16, 19-15f, 19-16, 20-17
Organizations
hydropower generation, 11-13
Outdoor wood boilers (OWB), 14-5
Overloads
in closed feedwater heat, 29-8 to 29-9
OWEZ. See Offshore Wind Farm Egmond aan Zee (OWEZ)
Owners, hydropower, 11-13
Oxidant and combustion byproducts, 18-2f
Oxidative degradation, 18-15
Oxides of nitrogen, 27-17
Oxy-combustion. See Carbon capture technologies
Oxigenated water treatment (OWT), 17-7
Oxygenates, 20-17

Packed bed CO2 absorber column, 18-10
Parabolic dish systems, 2-8 to 2-9
Parabolic trough collectors (PTC), 3-4, 3-5, 3-6 to 3-7
components of, 3-6 to 3-7
electricity generation with, 3-7 to 3-9
R&D in, 3-22
thermal energy storage and new thermal fluids, 3-9 to 3-12
thermal oils used in, 3-6
Parabolic trough concentrators, 2-25, 5-6
Parabolic trough solar power technology, 2-2 to 2-3, 5-6
reduction in cost of, 2-12
Partial oxidation, 20-3
Particle size of biomass, 14-2
Particulate emissions, 16-15, 16-15f
Passive solar energy technology
solar chimney, 5-4
solar cooker, 5-3 to 5-4
solar furnace, 5-4
thermal collectors, 5-3
thermal mass, 5-3
thermosiphon, 5-3
Passive space heating systems, 2-21
PCCC technology. See Post-combustion carbon capture
PCM. See Phase change media (PCM)
Pearson, Gerald, 5-1
Pebble bed version, 23-17, 23-17f
Pelton turbine, 11-5
Performance evaluation technique
power tower systems, 2-7 to 2-8
Performance Metric Project, 2-13
Performance parameters
for closed feedwater heaters, 29-8
Permanent geologic repository, 24-11
Petroleum dependence. See also Bioenergy
consumption, 19-3 to 19-4, 19-3f
measures of, 19-1 to 19-2, 19-1f
days coverage (stock), 19-2, 19-2f
days import coverage, 19-2, 19-2f
export dependence, 19-2 to 19-3, 19-3f
import percent of consumption, 19-2, 19-2f
NIMBY (not in my back yard)
electricity use by source, 19-12 to 19-13, 19-12f, 19-13f, 19-14f
ultimate fuel use, 19-13 to 19-14
price/production/geopolitics, 19-14 to 19-15, 19-14f, 19-15f
OPEC, 19-15f, 19-16
sectors, 19-4f
commercial, 19-5 to 19-7, 19-6f, 19-7f
electric power generation, 19-8 to 19-11, 19-8f, 19-9f, 19-10f
industrial, 19-7 to 19-8, 19-7f, 19-8f
residential, 19-4 to 19-5, 19-4f, 19-5f
transportation, 19-10f, 19-11, 19-11f
PGCIL. See Power Grid Corporation of India Limited (PGCIL)
Phase change media (PCM), 3-10 to 3-11
Phase transformation zone (PTZ), 25-10
Photovoltaic (PV) systems
building applications of, 1-18 to 1-19
centration PV (CPV) systems. See Concentrating photovoltaic (CPV) systems
developmental history, 1-8
distributed. See Distributed photovoltaic systems
efficiencies and types of, 1-8, 1-9
large-scale, 2-9 to 2-11
1-6 MW system, 2-10
overview, 1-8 to 1-9
Photovoltaic (PV) technology, 5-5
Photovoltaic Specialist Conference (PVSC), 6-2
Piping system design
power tower systems, 2-6 to 2-7
Piping system tolerances, 21-6 to 21-7
Piszczor, Michael, 6-11
Pittsburgh Natural Gas, 17-3
Piping system design
power tower systems, 2-6 to 2-7
Piping system tolerances, 21-6 to 21-7
Pyszczor, Michael, 6-11
Pittsburgh Natural Gas, 17-3
Power Grid Corporation of India Limited (PGCIL)
See also PETCOE
Power Grid Corporation of India Limited (PGCIL)
See also PETCOE
Power tower systems, 2-5 to 2-6
Power tower systems, 2-6 to 2-7
Overview, 1-8 to 1-9
Electricity generation in, 1-8, 1-9
Efficiencies and types of, 1-8, 1-9
1-6 MW system, 2-10
Overview, 1-8 to 1-9
Photovoltaic (PV) systems
building applications of, 1-18 to 1-19
Concentration PV (CPV) systems. See Concentrating photovoltaic (CPV) systems
developmental history, 1-8
distributed. See Distributed photovoltaic systems
efficiencies and types of, 1-8, 1-9
large-scale, 2-9 to 2-11
1-6 MW system, 2-10
overview, 1-8 to 1-9
Photovoltaic (PV) technology, 5-5
Photovoltaic Specialist Conference (PVSC), 6-2
Piping system design
power tower systems, 2-6 to 2-7
Piping system tolerances, 21-6 to 21-7
Pyszczor, Michael, 6-11
Pittsburgh Natural Gas, 17-3
Plate heat exchangers, 29-2
Poncelet, Jean, 11-1
Post-combustion carbon capture
commercial plant, 18-14 to 18-16
process description
CO2 absorber system, 18-10 to 18-11
flue gas system, 18-10
solvent regenerator system, 18-11
reference plant, 18-14, 18-14f
state of development, 18-11 to 18-12, 18-11f, 18-12f
CO2 control laboratory, 18-12 to 18-13, 18-12f
PCCC pilot plant, 18-13 to 18-14, 18-13f
Post-independence development of hydropower in India, 12-5
Potential energy supply, for U.S., 8-3 to 8-5
I-12 • INDEX

Power block equipment options, 18-6 to 18-7
Power density of waves, 13-2, 13-2f
Power development. See Geothermal energy
Power Grid Corporation of India Limited (PGCIL), 10-2
Power plant steam usage, 18-16
Power Purchase Agreement (PPA), 10-2
Power take-off subsystem, 13-4
Power tower systems, 1-5, 1-6, 3-5
air versus water condenser cooling, 2-3 to 2-5
energy cost analysis for, 2-5
experience in, 3-16
heliostats and solar receivers technology, 3-14 to 3-16
melted salt systems, 3-18 to 3-19
optical durability, 2-5 to 2-6
optimal piping design, 2-6 to 2-7
performance evaluation technique, 2-7 to 2-8
R&D in, 3-22 to 3-23
water/steam plants from PS10 project to superheated steam, 3-16 to 3-18
PPA. See Power Purchase Agreement (PPA)
Pre-independence development of hydropower in India, 12-4 to 12-5
Prenflo Direct Quench (PDQ) process, 20-7
Prenflo (pressurized entrained flow) gasifiers, 20-7, 20-7f
Pressure drop, 2-3 to 2-5
air or water cooling for, 2-3 to 2-5
in cleaning solar collection units, 1-16
Pyrolysis, 14-10
Radars
impacts on wind power systems, 8-8 to 8-9
Radiant floor systems, 2-21
Radiation exposure, 24-4 to 24-5
Radiators, 2-21
Radioactive waste disposal, 24-6, 24-7
Rain
in cleaning solar collection units, 1-16
Rankine cycle, 1-3 to 1-4, 20-12, 20-12f, 20-13f, 26-2f, 27-9 to 27-10
air or water cooling for, 2-3 to 2-5
heat rate and steam rate, 27-10 to 27-11
regenerative-reheat, 27-11
turbine component efficiency, 27-11
REA. See Rural Electrification Act (REA)
Reaction and control subsystem, 13-4
Reactor pressure boundaries, 23-25
Reactors
solar chemical, for hydrogen production, 2-27 to 2-28
Reactors, new generation
advanced reactor projects
light water reactors, 23-6 to 23-7
small modular reactors, 23-7 to 23-8
crosscutting GIF issues, 23-31
design considerations, 23-29 to 23-31, 23-30t
gas-cooled fast reactor (GFR), 23-20 to 23-21
generation IV initiative, 23-1 to 23-3, 23-2f, 23-2t, 23-3f, 23-4t
gas-cooled reactors, 23-5 to 23-6
liquid metal reactors (LMRs), 23-4 to 23-5
molten salt reactor (MSR), 23-6
super critical water reactor, 23-6
international R&D, 23-31 to 23-32
lead-cooled fast reactor (LFR), 23-19 to 23-20
molten salt reactor (MSR), 23-21 to 23-22
non-destructive examination (NDE), 23-31
outlines of, 23-1
sodium fast reactors
in China, 23-14
in Europe, 23-14 to 23-15, 23-14f
in India, 23-11 to 23-13, 23-12f, 23-13f
in Japan, 23-8 to 23-10, 23-9f, 23-10t
in Russia, 23-13 to 23-14
in United States, 23-15
super critical water reactor (SCWR), 23-21
technical aspects
fuel and fuel cycle, 23-22 to 23-24, 23-24t
structural materials, 23-25 to 23-29, 23-26
very-high-temperature gas-cooled reactor, 23-16t
in China, 23-19, 23-19t
in Japan, 23-19
in Korea, 23-19
in South Africa, 23-19
in United States, 23-15 to 23-19
Reactor vessel embrittlement, 22-3
Reagan, Ronald, 1-1
REC. See Renewable Energy Certificates (REC)
Recycle with oxy-combustion, 18-4 to 18-5, 18-4f, 18-5f
Reference plant, 18-14, 18-14f
Regenerative heating
defined, 27-11
Reliability of a power plant, 27-27 to 27-29
Reliability of plant, 27-28
Remote Area Power Supply (RAPS), 28-3 to 28-4
level 1 RAPS development, 28-4 to 28-5
level 2 RAPS development, 28-5 to 28-6
level 3 RAPS development, 28-6
level 4 RAPS development, 28-6
level 5 RAPS development, 28-6
phases of development, 28-4
Renewable electricity generation
energy storage with, 2-11
Renewable Energy Certificates (REC), 10-5 to 10-6
Renewable Energy Demonstration (REDP) grant, 28-3
Renewable energy developments, performance of
dynamic resistive frequency controller, 28-13
Huxley Hill wind farm, 28-11
King Island Solar, 28-13
system performance, 28-11
vanadium redox battery, 28-11 to 28-13
Vestas V52 turbines, 28-13
Renewable energy portfolio standards (RPS), 19-35
2010 Renewable Energy World Conference, 1-8
Renewable Fuels Standard regulations (RFS2), 19-35
Renewable Portfolio Standard (RPS), 11-14
Reservoir drawdown, 16-17
Resettlement and rehabilitation (R&R) policies, in India, 12-11
Residential heat energy, 19-25 to 19-26, 19-25f, 19-29f
Residential petroleum consumption, 19-4 to 19-5, 19-4f, 19-5f
Resource Conservation and Recovery Act (RCRA), 15-2
Reverse osmosis (RO), 2-26
Reynolds–Averaged Navier Stokes, 26-17
Rich solvent solution heating, 18-10 to 18-11
Risk, 27-29
RO. See Reverse osmosis (RO)
Roof-mounted BIPV systems
cement tile systems, 2-15 to 2-16
shingle systems, 2-16
thin-film PV laminate for standing seam metal roofs, 2-16
Rotor forging assessment, 25-5 to 25-10, 25-7f, 25-8f
RPS. See Renewable Portfolio Standard (RPS)
Rural Electrification Act (REA), 11-3
SAA. See Space Act Agreements (SAA)
Sandia National Laboratories (SNL), 2-8
history in wind energy, 7-2 to 7-4
transition to HAWT’s in the mid 1990s, 7-4 to 7-8
VAWT program, 7-3 to 7-4
Scale, 13-7f
Scanning Tunneling Optical Resonance Microscopy (STORM), 6-12
SCARLET. See Solar Concentrator Array with Refractive Linear Element Technology (SCARLET)
Scrap tires, 15-6 to 15-7
SDWH systems. See Solar domestic water heating (SDWH) systems
Second Law of Thermodynamics, 1-2
Second World War, 1-1
Second World War, 1-1
Section III code, 21-1 to 21-2, 21-3 to 21-4
SEGSs. See Solar Energy Generating Systems (SEGSs)
Seismicity, induced, 16-17 to 16-18, 16-18f
Sensors systems
role on wind turbine design, 7-11 to 7-12
SERC. See State Electricity Regulatory Commission (SERC)
SERT program. See SSP Exploratory Research and Technology (SERT) program
SES. See Stirling Energy Systems (SES)
Sewage sludge, 15-7
Shell-and-tube heat exchangers, 29-1
Shell coal gasification process (SCGP), 20-7
Shingle systems, 2-16
Sierra SunTower plant, 2-3
Silicon cells, 1-8
using, 6-1
Single-input–single-output (SISO) controllers, 7-12
SISO controllers. See Single-input–single-output (SISO) controllers
Siting (environmental setting), 13-6, 13-7f
Slurry feed, 20-7
Small boiler simulator (SBS), 18-3, 18-13
Small hydro programs, in India
economic viability and comparison with other sources, 12-8
goals of, 12-7 to 12-8
issues constraints, appraisal, and clearances, 12-9
potential and status of development, 12-8
renewable energy policy of Central/State Government, 12-8
Small modular reactors, 23-7 to 23-8
Small-scale power generation, 14-6 to 14-7
Small-scale PV systems. See also Photovoltaic (PV) systems
vs. large-scale PV systems, 2-18
Small-scale systems, 14-5
SMART rotor program, 7-16
Smart rotors, 9-6
Smeaton, John, 11-1
Smith, Willoughby, 5-1
Smoke, 27-16
SMR. See Steam-methane reforming (SMR)
SNG. See Synthetic natural gas (SNG)
SNL. See Sandia National Laboratories (SNL)
SODAR. See Sonic Detection and Ranging (SODAR)
Sodium-cooled fast reactor (SFR), 23-4 to 23-5
Sodium fast reactors. See under Reactors, new generation
Solar absorption technology, 2-21 to 2-22
Solar bowl, 5-7
Solar building space cooling, 1-19
Solar cell, 32-1 to 32-3
Solar chemical reactors, for hydrogen production, 2-27 to 2-28
Solar chimney, 5-4
Solar collectors, 2-18, 5-3
types of, 2-18 to 2-19
Solar Concentrator Array with Refractive Linear Element Technology (SCARLET), 6-7
Solar cooker, 5-3 to 5-4
Solar domestic water heating (SDWH) systems, 1-17 to 1-18
Solar Dynamics Observatory mission, 6-10
Solar energy. See also Solar energy systems
production, 5-10
residential and commercial usages, 5-9 to 5-10
role of, 5-11
Solar energy, building applications of
BES codes, 1-16
desiccant dehumidification/cooling system, 1-19
net zero energy buildings, 1-16 to 1-17
overview, 1-16
photovoltaic applications, 1-18 to 1-19
solar building space cooling, 1-19
solar domestic water heating systems, 1-17 to 1-18
solar lighting, 1-19
Solar Energy Generating Systems (SEGSs), 2-2 to 2-3, 3-8
Solar energy systems. See also specific systems
active solar technologies. See Active solar technologies
classification, 2-1
future prospects, 5-11 to 5-13
historical perspectives, 5-1 to 5-2
in India. See India, solar energy applications in
passive solar energy technology. See Passive solar energy technology
storing energy. See Energy storage
Solar furnace, 5-4
Solargenix (Acciona Solar Power), 1-4
Solar heating and cooling, for air-conditioning systems
active systems, 2-21
passive systems, 2-21
PV/thermal hybrid systems, 2-22
solar absorption technology, 2-21 to 2-22
space heating, 2-21
Solar home systems, in India, 4-6
Solar lighting systems, 1-19
in India, 4-6
Solar mission
and future in India, 4-6 to 4-8
Solar One, 1-5
Solar power conversion, utility scale
collection, use of, 1-1 to 1-2
global development, historical perspectives, 1-1
photovoltaic approaches, 1-8 to 1-12
thermal power generation, approaches for, 1-3 to 1-8
Solar-powered radiant floors, 2-21
Solar-powered radiators, 2-21
Solar process heat for manufacturing
advanced flat-plate collectors, 2-23
compound parabolic concentrator collectors, 2-24 to 2-25
concentrating collectors with stationary reflector, 2-25 to 2-26
evacuated tubes, 2-23 to 2-24
linear concentrating Fresnel collectors, 2-25
parabolic trough concentrators, 2-25
Solar receivers, 3-14 to 3-16
defined, 3-13
Solar space heating systems, 2-21
Solar’s potential, 5-12 to 5-13
Solar thermal cooking systems
in India, 4-2 to 4-3
Solar Thermal Electricity (STE), 3-1
Solar thermal hot water systems
in India, 4-3 to 4-4
Solar thermal power generation
in India, 4-5 to 4-6
Solar thermal power generation systems. See also Thermal power generation, approaches for
parabolic dish and Stirling engine technology, 2-8 to 2-9
parabolic trough solar power technology, 2-2 to 2-3
power tower systems, 2-3 to 2-8
Solar thermal power plants
development of, 3-1 to 3-2
dish/Stirling systems, 3-19 to 3-21
linear-Fresnel reflectors, 3-12 to 3-13
overview, 3-1
parabolic-troughs, 3-6 to 3-12
power towers systems, 3-13 to 3-19
schemes and technologies, 3-2 to 3-6
STE systems, 3-1 to 3-2
characteristics of, 3-5
fundamentals for, 3-2 to 3-4
technology development needs and market opportunities for, 3-21 to 3-23
Solar thermal systems
for buildings
overview, 2-18
solar heating and cooling for air-conditioning systems, 2-21 to 2-22
solar water heating systems, 2-18 to 2-21
for industries in India, 4-4 to 4-5
Solar Tower concept, 5-6 to 5-7
Solar water heating systems
collectors, 2-18 to 2-19
freezing issue, 2-20 to 2-21
systems, 2-19 to 2-20
SolFocus, Inc., 2-10
Solid oxide fuel cells (SOFC), 14-6
Solid particle erosion (SPE), 26-19
Solid particulate removal, 18-5
Solid waste management hierarchy, 15-2f
SolPipe, 2-6
vs. NREL, 2-7
Solvent degradation, 18-15
Solvent regenerator system, 18-11
Sonic Detection and Ranging (SODAR), 8-14
Soybean oil, 19-24
Space Act Agreements (SAA), 6-13
Space heating systems, 2-21
Space Photovoltaic Research and Technology (SPRAT) conference, 6-2
Space power satellites (SPS), 6-15
Spatially uniform pressure drop, 30-7
SPRAT conference. See Space Photovoltaic Research and Technology (SPRAT) conference
Spreader stoker boilers, 14-7 to 14-8, 14-7f
SPS. See Space power satellites (SPS)
Sri Lanka, wind energy technology in, 10-13
SSP Exploratory Research and Technology (SERT) program, 6-15
Stardust mission, 6-9
State Electricity Regulatory Commission (SERC), 10-2 to 10-3, 12-11
STE. See Solar Thermal Electricity (STE)
Steam-carbon reaction, 20-3
Steam-methane reforming (SMR)
for hydrogen generation, 1-12
Steam rate, 27-11
Steamside oxidation, 17-4
Steam turbine
compound-flow or tandem compound turbine, 27-24
cross compound design, 27-24
single-flow single-casing extraction, 27-23 to 27-24
steam turbine characteristics, 27-24 to 27-26
Steam turbine and generator inspection
disk rim blade attachment dovetails, 25-13 to 25-17, 25-13f, 25-14f, 25-15f, 25-16f
generator rotors, 25-18 to 25-19, 25-19f
retaining rings, 25-19 to 25-23, 25-20f
tooth top cracking, 25-23 to 25-26, 25-24f
inspection validation, 25-27
material properties characterization, 25-26 to 25-27, 25-26f
non-destructive evaluation (NDE)
eddy current testing, 25-3
liquid penetrant testing, 25-3
magnetic particle testing (MT), 25-3
ultrasonic testing (UT), 25-3
visual testing (VT), 25-3
outlines of, 25-1 to 25-2
repairs, 25-27 to 25-28
rotor forging assessment, 25-5 to 25-10, 25-7f, 25-8f
solid (unbored) turbine rotors, 25-17 to 25-18, 25-18f
turbine components
overview of, 25-3 to 25-5
periodic life assessment, 25-5, 25-5f
turbine design, 25-3 to 25-5
turbine disks, 25-10 to 25-12, 25-10f, 25-11f, 25-12f
Steam turbines for power generation
design of, 26-14 to 26-20, 26-16f, 26-17f, 26-18f, 26-19f
operation and maintenance, 26-21 to 26-24, 26-22f, 26-23f, 26-24
performance of, 26-20 to 26-21, 26-21f
thermodynamic concepts of, 26-1 to 26-9, 26-2f, 26-3f, 26-4f, 26-5f, 26-7f, 26-8f
turbine configurations, 26-9 to 26-14, 26-10f, 26-11f, 26-12f, 26-13f, 26-14f
Steel industry, 15-6
Stella, Paul, 6-10
Stirling Energy Systems (SES), 1-7
components, 2-8
functions, 2-8 to 2-9
Stirling engine technology, 2-8 to 2-9, 5-6
Stirling Thermal Motors (STM), 1-7
STM. See Stirling Thermal Motors (STM)
Storage. See Energy storage
STORM. See Scanning Tunneling Optical Resonance Microscopy (STORM)
Strategic Petroleum Reserve (SPR), U.S., 19-2
Stress And Fracture Evaluation of Rotors (SAFER), 25-8
Subsonic and supersonic expansion, 26-3f
Sulfur removal, 18-6
Suncatcher™, 1-7
Superconducting magnetic energy storage, 5-9
Super critical water reactor (SCWR), 23-6, 23-21
Surface condenser
cathodic protection, 30-15 to 30-16
condensate depression, 30-4, 30-6 to 30-7
design considerations, 30-1 to 30-2
heat transfer relations for a condenser with nonsegmental tube supports, 30-12 to 30-13
off-design condition operation and noncondensibles removal, 30-14 to 30-15
Pressure drop, 30-7
sizing, 30-9 to 30-10
spatially uniform pressure drop, 30-7
stagnant regions, 30-7
terminal temperature difference, 30-4
thermal centerline, 30-4 to 30-6
tube bundle design, 30-7 to 30-9
tube supports and noncondensibles accumulation, 30-11 to 30-12
Surface condenser construction, 30-2 to 30-4
Surface condenser sizing, 30-9 to 30-10
Surface condenser technology definitions, 30-4
"Synchronous generators," 11-5
Synthetic natural gas (SNG), 20-14 to 20-15, 20-14f, 20-18
System (tidal-generating equipment), 13-6
Taylor–Dunn electric utility vehicle, 1-14, 1-15
Technical innovation, 19-18 to 19-19, 19-19f
Techno-economic clearances, in India, 12-14 to 12-15
Technology deployment and certification in India, 10-9 to 10-10
Tellier, Charles, 5-1
Telstar, 6-3
Temperature rise, 30-4
Temper embrittlement, 25-9
Terminal temperature difference, 30-4
Testing power plant heat exchangers for structural integrity and tightness, 29-9
Texaco coal gasification process, 20-7
Thermal centerline, 30-4 to 30-6
Thermal collectors, 5-3
Thermal degradation, 18-15
Thermal mass, 5-3
Thermal NOx defined, 27-17
Thermal oils in parabolic trough collectors, 3-6
Thermal power generation, approaches for. See also Solar thermal power generation systems
dish stirling systems, 1-5, 1-7
power tower (central receiver) systems, 1-5, 1-6
Rankine cycles, 1-3 to 1-4
thermal storage, 1-7 to 1-8
trough technology, 1-4 to 1-5
Thermal power plants, 27-1
diesel engine-based power plants, 27-1
simple cycle gas turbine power plants, 27-1
steam turbine power plants, 27-1
Thermal Power Research Institute (TPRI) gasifier, 20-9, 20-9f, 20-10f
Thermal storage, 1-7 to 1-8
Thermochemical process, 15-14
Thermodynamic concepts, 26-1 to 26-9, 26-2f, 26-3f, 26-4f, 26-5f, 26-6f, 26-7f, 26-8f
Thermosiphon, 5-3
evacuated tube solar collectors, 2-19
Thermosiphoning, 2-19
Thermosiphon passive systems, 2-19
Thin-film CdTe solar cells, 2-15
Thin-film copper indium selenium (CIS), 2-15
Thin-film PV laminate for standing seam metal roofs, 2-16
Thin-film solar cells development of, 2-14
types of, 2-14, 2-15
Thorium cycles, 23-24
12th Plan (2012 to 217), hydro development strategy during, 12-7
Three Mile Island (TMI), 24-3
Tidal and wave power ecological effects of, 13-6f
adaptive management, 13-6f, 13-7
assessment of, 13-7 to 13-8
scale, 13-7f
siting, 13-6, 13-7f
system, 13-6
engineering opportunities, 13-4 to 13-5, 13-4t
sociological and economic factors, 13-5 to 13-6, 13-6t
sources of energy, 13-1 to 13-2
tidal energy, 13-2 to 13-3
wave energy, 13-2, 13-2f, 13-3f, 13-3t
Tidal instream energy conversion devices (TISEC), 13-3
Tidal technologies, 13-4
time-dependent deformation (creep), 32-19
time-of-flight diffraction (TOFD), 25-22
Tirumala Tirupati Devasthanam (Tirumala), 4-3, 4-7
Titanium aluminum nitride, 32-12
Titanium boron carbon nitride, 32-13
Titanium carbide, 32-11
Titanium chromium nitride, 32-12 to 32-13
Titanium nitride, 32-12
Tooth top cracking, generator rotor, 25-23 to 25-26, 25-26f
Torrefaction, 14-10
Total exhaust loss, 26-7, 26-7f
Tradeable renewable energy credits (TREC), 16-20
Transonic turbine blades, 26-7
Transportation consumption by fuel, 19-10f, 19-11, 19-11f
Transportation logistics, 15-13
Transport reactor integrated gasification (TRIG), 20-5, 20-6f
Trough technology, 1-4 to 1-5
energy cost analysis for, 2-3
parabolic, 2-2 to 2-3
Tube bundle design, 30-7 to 30-9
Tube supports and noncondensibles accumulation, 30-11 to 30-12
Turbine, 32-4 to 32-6
blades, 25-13
components. See under Steam turbine and generator inspection design, 25-3 to 25-5
disks, 25-10 to 25-12, 25-10f, 25-11f, 25-12f
Turbine configurations, steam, 26-9 to 26-14, 26-10f, 26-11f, 26-12f, 26-13f, 26-14f
Turbine driven boiler feed pump (TDBFP), 17-2
Turbine rotors, solid (unbored), 25-17 to 25-18, 25-18f
Turbine throttle pressure selection, 17-3 to 17-4, 17-4f
U-Gas process, 20-5, 20-5f
Ultrasonic testing (UT), 25-3
Unburnt hydrocarbon (UHC), 27-16 to 27-17
United States (U.S.) hydropower history of, 11-2 to 11-3
solar radiation resource in, 1-2, 1-3
wind energy in consistent policy support, 8-10
electric transmission, 8-10 to 8-11
environmental issues, 8-8
farm design, 8-16 to 8-19
farm development, 8-11
local impacts, 8-9
plant economy, 8-5 to 8-7
radar impacts, 8-8 to 8-9
research related to, 8-19 to 8-22
resource assessment, 8-11 to 8316
resources for, 8-2 to 8-4
technical issues, 8-7 to 8-8
wind turbine technologies, 8-1 to 8-2
Up-conversion technology and nano-structured materials, 32-3
Upper Volta project, 6-4
UpWind, 9-5 to 9-6
Uranium mining, risks of, 24-4
Urban residues, 14-4
Urban wood residues (UWW), 14-2, 14-3
U.S. Agency for International Development (AID), 6-4
U.S. Green Building Council (USGBC), 5-3
U.S. National Research Council (NRC), 6-15
U.S. Department of Energy, 1-1
Used fuel containers, 24-6
Used fuel disposal strategy, 24-5
Used fuel recycling, 24-11
Used oil, 15-8
USGBC. See U.S. Green Building Council (USGBC)
U.S. Nuclear Regulatory Commission (NRC), 21-5
Utility Geothermal Working Group (UGWG), 16-11
Vacuum induction melting (VIM) process, 17-15
Vanguard I, 5-1, 5-5, 6-1
Vapor recompression, 18-16
VAWT. See Vertical Axis Wind Turbine (VAWT) Program, SNL's
future of research, 7-4
history of, 7-3
R&D beginning of, 7-3
tech transfer, 7-3 to 7-4
using information for a new, larger machine, 7-4
Very-high-temperature gas-cooled reactor. See under Reactors, new
generation
Village electrification systems using solar PV, in India, 4-2
Visual impacts
impacts on wind power systems, 8-9
Visual testing (VT), 25-3
Visual Weld Acceptance Criteria (VWAC), 21-4 to 21-5
Volatile ash, 14-2, 14-3f, 14-3t
Wall-fired boilers, 14-9
Waste
definition of, 15-1 to 15-4, 15-2f, 15-3f
handling and storage of, 15-12
minimization, 15-13 to 15-14
supply of, 15-12 to 15-13
treatment, 19-21
Waste heat recovery, 15-19 to 15-20
Waste material utilization
anaerobic digestion, use of, 15-14 to 15-15
business risks/liabilities, 15-12
byproducts of, 15-5 to 15-9
community relations, 15-13
economic and environmental benefits, 15-10 to 15-11
energy recovery
in chemical industry, 15-5
in pulp and paper industry, 15-5 to 15-6
in steel industry, 15-6
energy value of waste, 15-4 to 15-5, 15-4t
gasification, 15-14 to 15-15
hazardous waste fuels
in cement industry (case study), 15-15 to 15-17, 15-15f, 15-16t
heat vs power, 15-11 to 15-12
municipal solid waste (MSW), 15-17 to 15-19, 15-18f, 15-19f
non-hazardous solid waste
auto shredder residue, 15-8 to 15-9
carpet waste, 15-9
crushing and demolition debris, 15-7
municipal wastewater treatment sludge, 15-7 to 15-8
scrap tires, 15-6 to 15-7
used oil, 15-8
outlines of, 15-1, 15-2f
recycling vs energy recovery, 15-14
regulatory drivers and obstacles, 15-10
regulatory overview
air permits, 15-4
waste, definition of, 15-1 to 15-4, 15-2f, 15-3f
storage and handling of wastes, 15-12
supply chain (of waste), 15-12 to 15-13
transportation logistics, 15-13
waste heat recovery, 15-19 to 15-20
waste minimization, 15-13 to 15-14
Waste to Energy Research and Technology Council (WTERT), 15-18
Water
collecting tanks, 17-8
collection, 16-17, 19-33
coverage, 16-18
Water energy storage, 5-9
Water gas shift, 20-3
Water/steam plants
from PS10 project to superheated steam, 3-16 to 3-18
Wave energy converters (WEC), 11-10 to 11-13, 13-4
Wave power flux, 13-2, 13-3t
Wear resistance, hard coatings for improved, 32-7 to 32-8
Weather Surveillance Radar-1988, Doppler (WSR-88D) systems, 8-9
WE@SEA program, 9-6
West Bengal Renewable Energy Development Agency, 4-2
Wet cement plants, 15-16
Wet fluorescent magnetic particle testing (WFMT), 25-3
Wetted-wall column (WWC), 18-12, 18-12f
Wieringermeer, ECN wind turbine test site, 9-11 to 9-12
Wildlife considerations
wind energy and, 8-8
Willsie, Henry, 5-1
Wilt, David, 6-10, 6-13
Wind energy
in China. See China, wind energy technology in
current status, 7-1 to 7-2
erosion, 32-4
future prospects, 6-21
historical perspectives, 7-1
icing, 32-4
in India. See India, wind energy technology in
insects, 32-4
offshore wind installations, 7-16 to 7-18
production tax credit for, 8-5 to 8-6
research, 8-19 to 8-22
in Netherlands, 9-1 to 9-15
role of NASA in, 6-16 to 6-21
Sandia’s HAWT program, 7-4 to 7-8
Sandia’s history in, 7-2 to 7-4
Sandia’s VAWT program, 7-3 to 7-4
SMART rotor program, 7-16
in Sri Lanka, 10-13
state of the industry, 7-8 to 7-14
advanced architecture, 7-13
advanced control strategies, 7-12
aeroacoustics, 7-9 to 7-10
aerodynamics, 7-11
design tools, 7-14
DOEs 20% by 2030 Scenario, 7-9
revitalizing U.S. clean manufacturing, 7-13
sensors and condition health monitoring, 7-11 to 7-12
testing and evaluation, 7-13 to 7-14
super-hydrophobic nano-coatings, 32-4
trends in, 7-1 to 7-2
in U.S. See United States (U.S.), wind energy in
Wind maps, 8-3 to 8-4
Wind plant economics
energy subsidies and incentives, 8-5 to 8-7
cost comparisons with others, 8-5
demand time energy, 8-7
green pricing programs, 8-6 to 8-7
non-dispatchable energy, cost of, 8-7
production tax credit, 8-5 to 8-6
turbine performance
  availability factor, 8-7
  capacity factor, 8-7
Wind plants
  design
    access roads, 8-17
    electrical collection system, 8-17 to 8-19
    permitting process, 8-19
    turbine placement and layout, 8-17
    turbine selection, 8-16
  development of, 8-11
Wind power, grid operations with, 8-7 to 8-8
Wind resources, in U.S.
  assessment of
    data analysis, 8-14 to 8-16
    micro-siting, 8-14
    power available in the wind, 8-11
    prospecting, 8-13 to 8-14
    wind shear, 8-12 to 8-13
    wind speed frequency distribution, 8-11 to 8-12
  high-resolution wind data, 8-4
in India, 10-7 to 10-9
local terrain effects, 8-4
potential, 8-2
potential energy supply, 8-3 to 8-5
wind maps, 8-3 to 8-4
Wind shear, 8-12 to 8-13
Wind speed frequency distribution, 8-11 to 8-12
Wind tunnels at TU Delft, 9-13 to 9-14
Wind turbine
  design, in India, 10-10 to 10-11
  energy payback time for, 8-7
  growth in India, 10-6 to 10-7
  performance
    availability factor, 8-7
    capacity factor, 8-7
    placement and layout, 8-17
    selection of, 8-16
  types of, 8-1 to 8-2
  Winkler gasifier, 20-5
Wolf, Martin, 6-1
Wood pellets, 14-4
Woody biomass, 14-3 to 14-4
WSR-88D systems
  See Weather Surveillance Radar-1988, Doppler (WSR-88D) systems
WTS-4, 6-18 to 6-19
Wyandot Solar Energy Facility, 2-9
xPRM. See Exploration Precursor Robotic Missions (xPRM)
xScout missions, 6-14
Yucca mountain license application, 24-11
Zero site energy building, 1-16