

CHAPTER ONE: INTRODUCTION.....	1
STUDY GOALS AND OBJECTIVES.....	1
REASONS FOR COMPLETING THIS STUDY .....	1
INTENDED AUDIENCE.....	2
SCOPE OF REPORT AND METHODOLOGY .....	2
WORLDWIDE MARKETS.....	3
<i>TABLE A LIST OF GLOBAL MARKETS CONSIDERED IN THIS STUDY</i> .....	4
METHODOLOGY.....	4
<i>TABLE B RESEARCH INFORMATION SOURCES</i> .....	5
INFORMATION SOURCES.....	5
ANALYST CREDENTIALS.....	5
RELATED REPORTS.....	6
BCC ONLINE SERVICES.....	6
DISCLAIMER .....	6
CHAPTER TWO: SUMMARY.....	7
SUMMARY.....	7
<i>SUMMARY TABLE UTILITY-SCALE ELECTRICITY STORAGE TECHNOLOGY SALES, THROUGH 2015 (\$ MILLIONS)</i> .....	8
<i>SUMMARY FIGURE UTILITY-SCALE ELECTRICITY STORAGE TECHNOLOGY SALES, 2008-2015 (\$ MILLIONS)</i> .....	8
CHAPTER THREE: OVERVIEW .....	9
<i>TABLE 1 UES TECHNOLOGIES CONSIDERED IN THIS REPORT (MW)</i> .....	9
WHAT ARE UTILITY-SCALE ELECTRICITY STORAGE TECHNOLOGIES?.....	9
WHAT ARE UTILITY-SCALE ELECTRICITY ...(CONTINUED).....	10
BRIEF HISTORY .....	11
COSTS AND ECONOMIC VIABILITY .....	12
PUMPED HYDROLOGIC STORAGE.....	12
COMPRESSED AIR ENERGY STORAGE.....	13
BENEFITS OF UTILITY-SCALE ELECTRICITY STORAGE TECHNOLOGIES.....	14
GRID BENEFITS .....	14
Load Leveling.....	15
<i>FIGURE 1 STYLIZED REPRESENTATION OF A DAILY LOAD CURVE</i> .....	16
Capacity Factor/Dispatch for Intermittent Renewables.....	16
Peaking Power Support.....	17
OFFSET OF NEEDED PEAKING POWER GENERATION CAPACITY .....	18
OFFSET OF NEEDED RENEWABLE GENERATION CAPACITY .....	19
ECONOMIC BENEFITS.....	20

Energy Arbitrage .....	20
Investment Deferral .....	20
RENEWABLE ENERGY DISPATCH AND TIMING BENEFITS (ABILITY TO MEET RENEWABLE ENERGY TARGETS, ETC.).....	20
Renewable Energy Dispatch and...(Continued).....	21
<i>FIGURE 2 EXAMPLE OF OFFSET RENEWABLE GENERATION: WIND GENERATION PROFILE FOR CALIFORNIA (MW)</i> .....	22
DRAWBACKS OF UTILITY-SCALE ELECTRICITY STORAGE TECHNOLOGIES.....	22
PHYSICAL CONSTRAINTS AND LAND REQUIREMENTS.....	23
WATER USE .....	23
ENVIRONMENTAL CONCERNS.....	24
ENERGY LOSS DURING STORAGE.....	25
ECONOMIC RISK.....	25
DESCRIPTION OF UTILITY-SCALE ELECTRICITY STORAGE TECHNOLOGIES AND SYSTEM COMPONENTS .....	26
PUMPED HYDROLOGIC STORAGE.....	26
<i>FIGURE 3 SALINA (OKLAHOMA) PUMPED STORAGE PROJECT</i> .....	27
<i>FIGURE 4 PHS SYSTEM UTILIZES SEAWATER, OKINAWA, JAPAN</i> .....	28
<i>FIGURE 5 EXCAVATED PHS CONCEPT</i> .....	29
Pumps and Turbines .....	29
<i>FIGURE 6 CROSS SECTION OF A REVERSIBLE PUMP TURBINE</i> .....	30
<i>FIGURE 7 REVERSIBLE PUMP TURBINE DURING ASSEMBLY</i> .....	31
<i>FIGURE 8 GENERATOR FOR A REVERSIBLE PUMP TURBINE</i> .....	31
COMPRESSED AIR ENERGY STORAGE .....	32
<i>FIGURE 9 HUNTORF CAES</i> .....	33
<i>FIGURE 10 MCINTOSH CAES</i> .....	33
Compressed Air Energy Storage...(Continued).....	34
<i>FIGURE 11 SCHEMATIC REPRESENTATION OF A CAES SYSTEM</i> .....	35
Air Compressors .....	35
<i>FIGURE 12 AXIAL AIR COMPRESSOR (LEFT) AND RADIAL AIR COMPRESSOR (RIGHT)</i> .....	36
Intercoolers and Aftercoolers .....	36
Recuperators .....	37
Expanders .....	37
<i>FIGURE 13 AIR EXPANDER</i> .....	38
Gas Turbine .....	38
<i>FIGURE 14 STANDARD GAS TURBINE WITH COMPRESSOR SECTION</i> .....	39
Generators .....	39
<i>FIGURE 15 MCINTOSH GAS TURBINE (BOTTOM), GENERATOR (TOP), AND EXHAUST (RIGHT)</i> .....	40
UTILITY APPLICATIONS.....	40

<i>TABLE 2 UTILITY APPLICATIONS OF PHS AND CAES</i> .....	41
EMERGING UTILITY-SCALE ELECTRICITY STORAGE TECHNOLOGIES.....	41
<i>FIGURE 16 COMPARISON OF PHS, CAES, AND EMERGING TECHNOLOGIES</i> .....	42
OVERVIEW OF SMALL-SCALE AND EMERGING TECHNOLOGIES .....	42
CAES Heat Storage and Advanced Adiabatic CAES .....	43
Lead-Acid Batteries .....	43
Lithium-Ion Batteries .....	43
Sodium-Sulfur Battery Systems .....	44
Vanadium Redox Battery Systems .....	44
Zinc-Bromine Battery Systems .....	44
Ultracapacitors .....	44
Flywheels .....	44
REVIEW OF RELEVANT EMERGING TECHNOLOGIES AND POTENTIAL FOR MARKET READINESS.....	45
<i>FIGURE 17 COMPARISON OF PHS, CAES, AND EMERGING TECHNOLOGIES</i> .....	45
Review of Relevant ... (Continued) .....	46
 CHAPTER FOUR: REGULATORY SUPPORT AND INCENTIVES FOR CAES AND PHS ENERGY STORAGE TECHNOLOGIES.....	47
REGULATORY SUPPORT AND INCENTIVES... ..	47
UNITED STATES REGULATORY SUPPORT AND INCENTIVES .....	48
FEDERAL.....	49
U.S. Internal Revenue Service .....	49
Renewable Electricity Production Tax Credit .....	49
<i>TABLE 3 RENEWABLE ELECTRICITY PRODUCTION TAX CREDIT: IN-SERVICE DEADLINE 2013 (¢/KWH)</i> .....	50
Qualifying Advanced Energy Manufacturing Investment Tax Credit .....	50
Clean Renewable Energy Bonds .....	51
Clean Renewable ... (Continued).....	52
Qualified Energy Conservation Bonds.....	53
U.S. Department of the Treasury .....	54
Renewable Energy Grants.....	54
U.S. Department of Energy .....	55
Green Power Purchasing Goal .....	55
Loan Guarantee Program .....	56
Innovative Technology Loan Guarantee Program.....	56
Temporary Loan Guarantee Program.....	57
Smart Grid Investment Grant Program .....	58
Initiative to Expand Hydropower.....	59

Renewable Electricity Production Incentive.....	59
U.S. Department of Agriculture.....	60
USDA Rural Energy for America Program —	
Grants and Loan Guarantees .....	60
SELECT STATE-LEVEL STANDARDS AND INCENTIVES .....	61
Alaska .....	62
Renewable Energy Grant Recommendation	
Program .....	62
Arizona .....	63
Renewable Energy Business Tax Incentive.....	63
Property Tax Assessment for Renewable Energy	
Property .....	64
Renewable Energy Standard.....	65
<i>TABLE 4 ARIZONA RENEWABLE ENERGY AND DISTRIBUTED</i>	
<i>RENEWABLE QUOTAS (RETAIL ELECTRICAL LOAD % [% OF</i>	
<i>RENEWABLE ENERGY QUOTA]).....</i>	<i>66</i>
California .....	67
Renewable Portfolio Standard.....	67
Renewable ... (Continued).....	68
Renewable ... (Continued).....	69
Colorado .....	70
Renewable Energy Property Tax Assessment .....	70
<i>TABLE 5 2009 COLORADO RENEWABLE ENERGY PROPERTY TAX</i>	
<i>ASSESSMENT COST THRESHOLD VALUES (\$/KW).....</i>	<i>70</i>
New Energy Economic Development Grant	
Program .....	71
Renewable Energy Standard.....	72
Requirement for Investor-Owned Utilities .....	72
<i>TABLE 6 COLORADO RENEWABLE PORTFOLIO STANDARD</i>	
<i>QUOTAS FOR INVESTOR-OWNED UTILITIES, 2007–2020 AND</i>	
<i>BEYOND .....</i>	<i>73</i>
Distributed Generation Carve-out (Investor-	
Owned Utilities Only) .....	73
<i>TABLE 7 COLORADO RENEWABLE PORTFOLIO STANDARD</i>	
<i>QUOTAS FOR WHOLESALE DISTRIBUTED GENERATION OR</i>	
<i>RETAIL DG CARVE-OUT, 2011–2020 AND BEYOND (%) .....</i>	<i>73</i>
Requirement for Cooperatives and Municipal	
Utilities.....	73
<i>TABLE 8 COLORADO RENEWABLE PORTFOLIO STANDARD</i>	
<i>QUOTAS FOR ELECTRIC COOPERATIVES AND MUNICIPAL</i>	
<i>UTILITIES, 2008–2020 AND BEYOND (%).....</i>	<i>74</i>
Credit Multipliers .....	74
Hawaii.....	75
Farm and Aquaculture Alternative Energy Loan .....	75

High Technology Business Investment Tax Credit.....	76
Renewable Energy Project Bond Program.....	77
Iowa.....	77
Alternative Energy Law (AEL) .....	77
Energy Replacement Generation Tax Exemption .....	78
Maine .....	79
Renewable Portfolio Standard.....	79
<i>TABLE 9 MAINE RENEWABLES PORTFOLIO STANDARD CLASS I</i>	
<i>STANDARD SCHEDULE, 2008–2017 AND BEYOND (%)</i> .....	80
Maine Wind Energy Goals.....	80
Maryland.....	81
Renewable Energy Portfolio Standard.....	81
<i>TABLE 10 MARYLAND RENEWABLE ENERGY PORTFOLIO</i>	
<i>STANDARD COMPLIANCE REQUIREMENTS, 2006–2022 AND</i>	
<i>BEYOND (%)</i> .....	82
Renewable ... (Continued).....	83
Renewable ... (Continued).....	84
Michigan .....	85
Renewable Energy Standard.....	85
<i>TABLE 11 MICHIGAN RENEWABLE ENERGY STANDARD, ANNUAL</i>	
<i>BENCHMARKS, 2012–2015</i> .....	86
Renewable ... (Continued).....	87
Renewable ... (Continued).....	88
New Mexico .....	89
Interconnection Standards .....	89
New York .....	90
Renewable, Clean Energy and Energy Efficient	
Product Manufacturing Incentive Program .....	90
Renewable, (Continued) .....	91
Oklahoma.....	92
Zero-Emission Facilities Production Tax Credit .....	92
Oregon.....	93
Business Energy Tax Credit.....	93
Business ... (Continued).....	94
Business ... (Continued).....	95
Pennsylvania.....	96
DECD Alternative Clean Energy Program.....	96
DECD ... (Continued) .....	97
Loans.....	98
Grants .....	98
Loan Guarantees.....	98
Texas .....	99
Austin — Renewables Portfolio Standard .....	99
Renewable Generation Requirement .....	100

<i>TABLE 12 TEXAS RENEWABLE GENERATION REQUIREMENT</i>	
<i>COMPLIANCE SCHEDULE, 2007–2015 (MW)</i> .....	101
Renewable ... (Continued).....	102
Department of Rural Affairs — Renewable Energy	
Demonstration Pilot Program.....	103
INTERNATIONAL REGULATORY SUPPORT AND	
INCENTIVES: EUROPE.....	104
European Union.....	104
EU Climate and Energy Package: Renewable	
Energy Targets .....	104
An Energy Policy for Europe .....	105
European Council Action Plan (2007–2009) Energy	
Policy for Europe .....	106
Seventh Framework Program for Research and	
Technological Development.....	107
<i>TABLE 13 ENERGY RESEARCH UNDER FP7</i> .....	107
Strategic Energy Technology Plan: Toward a Low	
Carbon Future .....	108
Directive on the Taxation of Energy Products and	
Electricity.....	108
Austria .....	109
Klima: Aktiv Program .....	109
Targets for Renewables: 2007–2010 Government	
Program .....	110
Belgium.....	110
Offshore Domanial Concessions for Wind and	
Ocean Energy Production.....	110
Offshore Wind Plant in the North Sea.....	111
Federal Green Certificate Scheme .....	111
Flanders: Green Certificate Scheme: .....	112
Wallonia: Green Certificate Scheme: .....	112
Denmark .....	113
Energy Research Programme.....	113
Electricity Supply Act.....	113
Subsidies for Renewable Electricity Generation .....	114
Replacement Scheme for Wind Turbines on Land .....	115
Agreement on Danish Energy Policy 2008–2011 .....	116
Promotion of Renewable Energy Act.....	117
Feed-in Premium Tariffs for Renewable Power .....	118
Feed-in ... (Continued) .....	119
France .....	120
Wind Energy Programme .....	120
Electricity Law 2000.....	120

Renewable Energy and Energy Efficiency Partnership .....	120
Hydropower Revival Plan .....	121
Germany .....	122
Green Power .....	122
Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz EEG) 2004 .....	123
Renewable Energy ... (Continued) .....	124
2009 Amendment of the Renewable Energy Sources Act .....	125
KfW Renewable Energies Program (KfW-Programme Erneuerbare Energien) .....	126
Greece .....	126
Development Incentives for Renewable Energy Sources .....	126
Italy .....	127
RES Promotion — Decrees Implementing Directive 2001/77/EC .....	127
Portugal .....	128
Wave Energy Pilot Zone .....	128
Renewable Feed-in Tariffs .....	128
Spain .....	128
Offshore Wind Power Regulations .....	128
Feed-in Tariffs for Electricity from Renewable Energy Sources .....	129
New Regulatory Framework for Administrative Procedures for Renewable Energy Facilities .....	130
Cabinet of Ministers Ruling for Wind and Solar Thermal Electric Energy Quotas .....	130
United Kingdom .....	131
Renewable Energy Strategy 2009 .....	131
Offshore Wind Capital Grants Scheme .....	132
INTERNATIONAL REGULATORY SUPPORT AND INCENTIVES: ASIA AND AUSTRALIA .....	133
Australia .....	133
Renewable Energy Target .....	133
Clean Energy Program .....	133
Renewable Energy Demonstration Program .....	134
Improving Grid Accessibility .....	134
China .....	135
Preferential Tax Policies for Renewable Energy .....	135
Medium- and Long-Term Development Plan for Renewable Energy .....	135
Wind Power Concession Programme .....	136

India .....	137
Indonesia.....	137
National Energy Blueprint.....	137
New Zealand .....	138
Marine Energy Deployment Fund .....	138
Thailand.....	138
Strategic Plan for Renewable Energy Development .....	138
CHAPTER FIVE: INDUSTRY STRUCTURE .....	139
INDUSTRY ORGANIZATION .....	139
<i>FIGURE 18 INDUSTRY STRUCTURE FOR</i>	
<i>PROCUREMENT/INSTALLATION OF PHS AND CAES</i>	
<i>TECHNOLOGIES.....</i>	<i>140</i>
UTILITY-SCALE ELECTRICITY STORAGE DEVELOPERS.....	140
ENGINEERING AND PROJECT MANAGEMENT	
CONTRACTORS.....	141
COMPONENT MANUFACTURERS AND FABRICATORS .....	142
CONSTRUCTION AND PROCUREMENT CONTRACTORS.....	142
RAW MATERIALS PRODUCERS .....	143
GLOBAL INDUSTRY STRUCTURE.....	143
NORTH AMERICA .....	143
Industry Trends.....	143
<i>FIGURE 19 CUMULATIVE TOTAL PHS INSTALLATIONS IN THE</i>	
<i>UNITED STATES, BY CAPACITY (MW).....</i>	<i>144</i>
Major Industry Players .....	145
<i>TABLE 14 MAJOR NORTH AMERICAN UES COMPONENT</i>	
<i>MANUFACTURERS AND ENGINEERS.....</i>	<i>146</i>
Major North American UES Industry Facets .....	146
EUROPE.....	147
Industry Trends.....	147
Industry Trends (Continued).....	148
<i>FIGURE 20 PHS INSTALLATIONS IN EUROPEAN COUNTRIES,</i>	
<i>TOTAL INSTALLED CAPACITY (MW) AND PERCENTAGE OF</i>	
<i>TOTAL GENERATION CAPACITY AS PHS (%) .....</i>	<i>149</i>
Major Industry Players .....	149
<i>TABLE 15 MAJOR EUROPEAN UES COMPONENT</i>	
<i>MANUFACTURERS AND ENGINEERS.....</i>	<i>150</i>
Major European UES Industry Facets .....	150
ASIA AND AUSTRALIA.....	151
Industry Trends.....	151
<i>FIGURE 21 CUMULATIVE TOTAL PHS INSTALLATIONS IN CHINA,</i>	
<i>BY CAPACITY (MW) .....</i>	<i>152</i>
Major Industry Players .....	152
<i>TABLE 16 MAJOR ASIAN UES COMPONENT MANUFACTURERS</i>	
<i>AND ENGINEERS .....</i>	<i>153</i>

Major European UES Industry Facets .....	153
UES INDUSTRY ORGANIZATIONS .....	154
<i>TABLE 17 MAJOR UES INDUSTRY GROUPS AND ORGANIZATIONS</i> .....	<i>154</i>
CHAPTER SIX: COMPANY PROFILES .....	155
PUMPED HYDROLOGIC STORAGE PRODUCTS AND SYSTEMS .....	155
TURBINES .....	155
ABB, Ltd. ....	155
North American Corporate Headquarters .....	155
<i>TABLE 18 COMPANY OVERVIEW: ABB, LTD.</i> .....	<i>156</i>
Alstom Hydro S.L. ....	157
Alstom Power, Inc. ....	157
<i>TABLE 19 COMPANY OVERVIEW: ALSTOM HYDRO S.L.</i> .....	<i>158</i>
American Hydro.....	158
<i>TABLE 20 COMPANY OVERVIEW: AMERICAN HYDRO</i> .....	<i>159</i>
Andritz Hydro GmbH .....	159
Andritz Hydro Corp. ....	160
<i>TABLE 21 COMPANY OVERVIEW: ANDRITZ HYDRO GMBH</i> .....	<i>161</i>
Ansaldo Energia .....	161
Milano Offices .....	161
<i>TABLE 22 COMPANY OVERVIEW: ANSALDO ENERGIA</i> .....	<i>162</i>
B. Maier Wasserkraft GmbH Anlagenbau .....	162
<i>TABLE 23 COMPANY OVERVIEW: B. MAIER WASSERKRAFT</i> .....	<i>163</i>
Bharat Heavy Electricals, Ltd. ....	164
<i>TABLE 24 COMPANY OVERVIEW: BHARAT HEAVY ELECTRICALS,</i> <i>LTD.</i> .....	<i>165</i>
Chongqing Lisong Electromechanical Equipment Co., Ltd. ....	165
<i>TABLE 25 COMPANY OVERVIEW: CHONGQING LISONG</i> <i>ELECTROMECHANICAL EQUIPMENT CO., LTD.</i> .....	<i>166</i>
Converteam Group SAS .....	166
Converteam, Inc. ....	166
Converteam Electric Machinery.....	166
<i>TABLE 26 COMPANY OVERVIEW: CONVERTEAM GROUP SAS</i> .....	<i>167</i>
Dongfang Electric Co., Ltd. ....	167
Dongfang — USA .....	168
<i>TABLE 27 COMPANY OVERVIEW: DONGFANG ELECTRIC CORP.</i> .....	<i>168</i>
Ebara Corp. ....	169
Ebara America Corp. ....	169
<i>TABLE 28 COMPANY OVERVIEW: EBARA CORP.</i> .....	<i>170</i>
Gilbert Gilkes & Gordon, Ltd.....	170
Gilkes, Inc. ....	170
<i>TABLE 29 COMPANY OVERVIEW: GILBERT GILKES &amp; GORDON,</i> <i>LTD.</i> .....	<i>171</i>
Global Hydro Energy GmbH .....	171
<i>TABLE 30 COMPANY OVERVIEW: GLOBAL HYDRO ENERGY GMBH</i> .....	<i>172</i>

	Gugler Water Turbines GmbH.....	173
<i>TABLE 31</i>	<i>COMPANY OVERVIEW: GUGLER WATER TURBINES GMBH.....</i>	<i>173</i>
	Harbin Electric Machinery Co., Ltd. ....	174
	Harbin Electric, Inc. ....	174
<i>TABLE 32</i>	<i>COMPANY OVERVIEW: HARBIN ELECTRIC MACHINERY CO., LTD.....</i>	<i>175</i>
	Hitachi, Ltd. Power Systems Co. ....	175
	Hitachi Power and Industrial Systems Division .....	175
	Hitachi Power Systems America.....	175
<i>TABLE 33</i>	<i>COMPANY OVERVIEW: HITACHI, LTD. POWER SYSTEMS CO.....</i>	<i>176</i>
	Hunan Lingling Hengyuan Generating Equipment Co., Ltd.....	177
<i>TABLE 34</i>	<i>COMPANY OVERVIEW: HUNAN LINGLING HENGYUAN GENERATING EQUIPMENT CO., LTD.....</i>	<i>178</i>
	Hyundai Ideal Electric Co. ....	178
<i>TABLE 35</i>	<i>COMPANY OVERVIEW: HYUNDAI IDEAL ELECTRIC CO.....</i>	<i>179</i>
	IMPISA International, Inc.....	179
	USA — IMPISA International.....	179
<i>TABLE 36</i>	<i>COMPANY OVERVIEW: IMPISA INTERNATIONAL, INC.....</i>	<i>180</i>
	Ingeteam Energy, SA.....	180
	Ingeteam Energy, SA.....	181
<i>TABLE 37</i>	<i>COMPANY OVERVIEW: INGETEAM ENERGY SA.....</i>	<i>182</i>
	JSC Turboengineering-Ruselprom.....	182
	Ruselprom Trade Office.....	182
<i>TABLE 38</i>	<i>COMPANY OVERVIEW: JSC TURBOENGINEERING- RUSELPROM .....</i>	<i>183</i>
	Kirloskar Brothers, Ltd.....	183
	Kirloskar Brothers, LLC.....	183
<i>TABLE 39</i>	<i>COMPANY OVERVIEW: KIRLOSKAR BROTHERS, LTD. ....</i>	<i>184</i>
	Litostroj Power d.o.o.....	185
	Litostroj Power — Litostroj Hydro, Inc.....	185
<i>TABLE 40</i>	<i>COMPANY OVERVIEW: LITOSTROJ POWER D.O.O.....</i>	<i>186</i>
	MarelliMotori.....	186
	Marelli USA, Inc. ....	186
<i>TABLE 41</i>	<i>COMPANY OVERVIEW: MARELLIMOTORI S.P.A.....</i>	<i>187</i>
	Mavel a.s. ....	187
	Mavel a.s. ....	187
<i>TABLE 42</i>	<i>COMPANY OVERVIEW: MAVEL A.S.....</i>	<i>188</i>
	Meidensha Corp.....	188
	Meiden America, Inc.....	189
<i>TABLE 43</i>	<i>COMPANY OVERVIEW: MEIDENSHA CORP.....</i>	<i>189</i>
	Mitsubishi Heavy Industries, Ltd.....	190

	Mitsubishi Electric Power Products, Inc.....	190
<i>TABLE 44</i>	<i>COMPANY OVERVIEW: MITSUBISHI HEAVY INDUSTRIES &amp; MISUBISHI ELECTRIC</i> .....	191
	OJSC Power Machines .....	191
<i>TABLE 45</i>	<i>COMPANY OVERVIEW: OJSC POWER MACHINES</i> .....	192
	OJSC Turboatom .....	192
<i>TABLE 46</i>	<i>COMPANY OVERVIEW: OJSC TURBOATOM</i> .....	193
	Orengine International, Ltd.....	194
<i>TABLE 47</i>	<i>COMPANY OVERVIEW: OREGINE INTERNATIONAL, LTD.</i> .....	194
	Ossberger GmbH + Co.....	195
	Ossberger Turbines, Inc. ....	195
<i>TABLE 48</i>	<i>COMPANY OVERVIEW: OSSBERGER GMBH + CO</i> .....	196
	Parsons Peebles Generation, Ltd. ....	196
<i>TABLE 49</i>	<i>COMPANY OVERVIEW: PARSONS PEBBLES GENERATION, LTD.</i> .....	197
	Rainpower Norway AS .....	197
<i>TABLE 50</i>	<i>COMPANY OVERVIEW: RAINPOWER NORWAY AS</i> .....	198
	Reivax Automação e Controle S/A .....	199
	Reivax North America, LLC .....	199
<i>TABLE 51</i>	<i>COMPANY OVERVIEW: REIVAX S/A AUTOMACAO CONTROLE</i> .....	200
	Rittmeyer AG.....	200
	U.S. Sales Office.....	200
<i>TABLE 52</i>	<i>COMPANY OVERVIEW: RITTMeyer AG</i> .....	201
	Sicmemotori SpA .....	201
	North American Business Manager .....	201
<i>TABLE 53</i>	<i>COMPANY OVERVIEW: SICMEMOTORI SPA</i> .....	202
	SPP Pumps .....	203
	SPP Pumps, Inc.....	203
<i>TABLE 54</i>	<i>COMPANY OVERVIEW: SPP PUMPS</i> .....	204
	Sundyne Corp. ....	204
<i>TABLE 55</i>	<i>COMPANY OVERVIEW: SUNDYNE CORP.</i> .....	205
	TES Vsetin a.s. ....	205
	U.S. Sales Agent .....	205
<i>TABLE 56</i>	<i>COMPANY OVERVIEW: TES VSETIN</i> .....	206
	Toshiba Hydro Power .....	206
	Toshiba Hydro Power .....	207
<i>TABLE 57</i>	<i>COMPANY OVERVIEW: TOSHIBA POWER SYSTEMS CO.</i> .....	208
	Tyco Flow Control — Tamar Designs .....	208
<i>TABLE 58</i>	<i>COMPANY OVERVIEW: TYCO TAMAR DESIGNS</i> .....	209
	UCM Resita Turbines.....	209
<i>TABLE 59</i>	<i>COMPANY OVERVIEW: UCM RESITA SA</i> .....	210
	VAP Hydro EOOD .....	211
<i>TABLE 60</i>	<i>COMPANY OVERVIEW: VAP HYDRO EOOD</i> .....	212

Voith Hydro GmbH + Co. KG.....	212
Peak Hydro Services, Inc.....	212
<i>TABLE 61 COMPANY OVERVIEW: VOITH HYDRO GMBH CO. KG.....</i>	<i>213</i>
Wasserkraft Volk AG.....	213
<i>TABLE 62 COMPANY OVERVIEW: WASSERKRAFT VOLK AG.....</i>	<i>214</i>
COMPRESSED AIR ENERGY STORAGE PRODUCTS AND SYSTEMS .....	215
ALMIG KOMPRESSOREN GMBH.....	215
ALMiG USA Corp. ....	215
<i>TABLE 63 COMPANY OVERVIEW: ALMIG KOMPRESSOREN GMBH.....</i>	<i>216</i>
ALSTOM POWER .....	216
U.S. Sales .....	216
<i>TABLE 64 COMPANY OVERVIEW: ALSTOM POWER .....</i>	<i>217</i>
ANSALDO ENERGIA .....	217
Milano Offices .....	218
<i>TABLE 65 COMPANY OVERVIEW: ANSALDO ENERGIA .....</i>	<i>219</i>
API HEAT TRANSFER, INC.....	219
<i>TABLE 66 COMPANY OVERVIEW: API HEAT TRANSFER, INC.....</i>	<i>220</i>
ATLAS COPCO GAS AND PROCESS GMBH .....	220
Atlas Copco Compressors, Inc. ....	220
<i>TABLE 67 COMPANY OVERVIEW: ATLAS COPCO GAS AND     PROCESS.....</i>	<i>221</i>
BAUER COMP HOLDING GMBH.....	221
Bauer Compressors, Inc. ....	222
<i>TABLE 68 COMPANY OVERVIEW: BAUER COMPRESSORS.....</i>	<i>223</i>
BRAYTON ENERGY, LLC .....	223
<i>TABLE 69 COMPANY OVERVIEW: BRAYTON ENERGY.....</i>	<i>224</i>
BTEC TURBINES, LP .....	224
<i>TABLE 70 COMPANY OVERVIEW: BTEC TUBINES, LP.....</i>	<i>225</i>
DRESSER-RAND .....	225
<i>TABLE 71 COMPANY OVERVIEW: DRESSER-RAND.....</i>	<i>226</i>
ELLIOTT CO. ....	227
Ebara Corp. ....	227
<i>TABLE 72 COMPANY OVERVIEW: ELLIOTT CO. ....</i>	<i>228</i>
GE ENERGY .....	228
<i>TABLE 73 COMPANY OVERVIEW: GE ENERGY.....</i>	<i>229</i>
MAN DIESEL & TURBO SE.....	229
MAN Diesel PrimeServ .....	229
<i>TABLE 74 COMPANY OVERVIEW: MAN DIESEL &amp; TURBO SE.....</i>	<i>230</i>
PARKER HANNIFIN.....	230
<i>TABLE 75 COMPANY OVERVIEW: PARKER HANNIFIN .....</i>	<i>231</i>
R&D DYNAMICS CORP.....	231
<i>TABLE 76 COMPANY OVERVIEW: R&amp;D DYNAMICS CORP.....</i>	<i>232</i>
SIEMENS ENERGY .....	233

<i>TABLE 77 COMPANY OVERVIEW: SIEMENS ENERGY</i> .....	234
SOLAR TURBINES, INC.....	234
<i>TABLE 78 COMPANY OVERVIEW: SOLAR TURBINES, INC.</i> .....	235
SOLARCAT, INC.....	235
<i>TABLE 79 COMPANY OVERVIEW: SOLARCAT, INC.</i> .....	236
SSS GEARS .....	236
SSS Clutch Co., Inc.....	236
<i>TABLE 80 COMPANY OVERVIEW: SSS GEARS, LTD.</i> .....	237
STRUTHERS WELLS.....	238
<i>TABLE 81 COMPANY OVERVIEW: STRUTHERS WELLS</i> .....	239
SUSTAINX .....	239
<i>TABLE 82 COMPANY OVERVIEW: SUSTAINX, INC.</i> .....	240

CHAPTER SEVEN: MAJOR MARKETS AND TRENDS IN PRICE AND PERFORMANCE .....

REGIONAL MARKETS AND TECHNOLOGY CHARACTERISTICS .....	241
UES MARKET PREREQUISITES.....	242
<i>TABLE 83 PREREQUISITES FOR UES TRACTION IN REGIONAL MARKETS</i> .....	243
DEMAND FOR UES TECHNOLOGIES.....	243
INFRASTRUCTURE SUFFICIENCY.....	243
SITING CONSIDERATIONS .....	244
GLOBAL MARKET CENTERS.....	245
NORTH AMERICA .....	245
<i>TABLE 84 MAJOR HISTORIC UES PROJECTS IN NORTH AMERICA (MW)</i> .....	246
<i>TABLE 85 FEDERAL ENERGY REGULATORY COMMISSION PHS PERMITTING ACTIVITY SINCE 2007 (MW)</i> .....	247
<i>FIGURE 22 LOCATIONS OF SELECT PROPOSED PHS PROJECTS</i> .....	248
<i>TABLE 86 NORTH AMERICAN CAES PROPOSED CAES PROJECTS SINCE 2007 (MW)</i> .....	249
Key Drivers for the North American Market .....	249
<i>FIGURE 23 CO-OCCURRENCE OF WIND RESOURCES AND GEOLOGIC FORMATIONS SUITABLE TO CAES</i> .....	250
Growth Potential for the North American Market .....	251
North American Market Projected Trends.....	252
North American ... (Continued) .....	253
<i>TABLE 87 PROJECTED NORTH AMERICAN PHS NEW CAPACITY AND MARKET SIZES, THROUGH 2015 (\$ MILLIONS)</i> .....	254
<i>FIGURE 24 PROJECTED NORTH AMERICAN PHS MARKET SIZES, THROUGH 2015 (\$ MILLIONS)</i> .....	254
<i>TABLE 88 PROJECTED NORTH AMERICAN CAES NEW CAPACITY AND MARKET SIZES, THROUGH 2015 (\$ MILLIONS)</i> .....	255
<i>FIGURE 25 PROJECTED NORTH AMERICAN CAES MARKET SIZES, THROUGH 2015 (\$ MILLIONS)</i> .....	256

PHS Storage/Appurtenances .....	256
EUROPE.....	256
TABLE 89 MAJOR HISTORIC UES PROJECTS IN EUROPE (MW).....	257
TABLE 89 (CONTINUED).....	258
Europe (Continued) .....	259
TABLE 90 ANNOUNCED EUROPEAN PHS PROJECTS (MW) .....	260
FIGURE 26 ANNOUNCED EUROPEAN PHS CAPACITY, BY COUNTRY (MW) .....	261
TABLE 91 EUROPEAN CAES ANNOUNCED CAES PROJECTS SINCE 2007 (MW) .....	262
Key Drivers for the European Market.....	262
Key Drivers ... (Continued) .....	263
FIGURE 27 CO-OCCURRENCE OF WIND RESOURCES AND GEOLOGIC FORMATIONS SUITABLE TO CAES .....	264
Growth Potential for the European Market .....	264
European Market Projected Trends.....	265
European Market ... (Continued).....	266
TABLE 92 PROJECTED EUROPEAN PHS NEW CAPACITY AND MARKET SIZES, THROUGH 2015 (\$ MILLIONS) .....	267
FIGURE 28 PROJECTED EUROPEAN PHS MARKET SIZES, THROUGH 2015 (\$ MILLIONS).....	267
TABLE 93 PROJECTED EUROPEAN CAES NEW CAPACITY AND MARKET SIZES, THROUGH 2015 (\$ MILLIONS) .....	268
FIGURE 29 PROJECTED EUROPEAN CAES MARKET SIZES, 2008- 2015 (\$ MILLIONS).....	269
ASIA/AUSTRALIA .....	269
TABLE 94 MAJOR HISTORIC UES PROJECTS IN ASIA AND AUSTRALIA (MW).....	270
Asia/Australia (Continued) .....	271
TABLE 95 ANNOUNCED ASIAN/AUSTRALIAN PHS PROJECTS (MW) ....	272
Key Drivers for the Asian/Australian Market.....	273
Key Drivers ... (Continued) .....	274
FIGURE 30 OCCURRENCE OF SALT FORMATIONS SUITABLE TO CAES .....	275
Growth Potential for the Asian/Australian Market .....	275
Asian/Australian Market Projected Trends .....	276
TABLE 96 PROJECTED ASIAN/AUSTRALIAN PHS NEW CAPACITY AND MARKET SIZES, THROUGH 2015 (\$ MILLIONS).....	277
FIGURE 31 PROJECTED ASIAN/AUSTRALIAN PHS MARKET SIZES, 2008-2015 (\$ MILLIONS).....	278
TABLE 97 PROJECTED ASIAN/AUSTRALIAN CAES NEW CAPACITY AND MARKET SIZES, THROUGH 2015 (\$ MILLIONS).....	279
FIGURE 32 PROJECTED ASIAN/AUSTRALIAN CAES MARKET SIZES, 2008-2015 (\$ MILLIONS).....	279

OVERVIEW OF THE GLOBAL UES TECHNOLOGY MARKET AND REGIONAL COMPARISON .....	280
<i>TABLE 98 GLOBAL PHS MARKET SIZES, REGIONAL COMPARISON, THROUGH 2015 (\$ MILLIONS)</i> .....	281
<i>FIGURE 33 GLOBAL PHS MARKET SIZES, REGIONAL COMPARISON, 2008-2015 (\$ MILLIONS)</i> .....	281
<i>TABLE 99 GLOBAL CAES MARKET SIZES, REGIONAL COMPARISON, THROUGH 2015 (\$ MILLIONS)</i> .....	282
<i>FIGURE 34 GLOBAL CAES MARKET SIZES, REGIONAL COMPARISON, 2008-2015 (\$ MILLIONS)</i> .....	282
<i>TABLE 100 TOTAL PROJECTED UES NEW CAPACITY, THROUGH 2015 (MW)</i> .....	283
<i>FIGURE 35 TOTAL PROJECTED UES NEW CAPACITY, 2008-2015 (MW)</i> .....	283
<i>TABLE 101 TOTAL PROJECTED UES MARKET SIZES, THROUGH 2015 (\$ MILLIONS)</i> .....	283
<i>FIGURE 36 TOTAL PROJECTED UES MARKET SIZES, 2008-2015 (\$ MILLIONS)</i> .....	284
APPENDIX I .....	285
CURRENCY CODES .....	285
ABBREVIATIONS OF UNITS OF MEASUREMENT .....	285
ACRONYMS .....	285
ACRONYMS (CONTINUED) .....	286
ACRONYMS (CONTINUED) .....	287
APPENDIX II.....	288
REFERENCES.....	288