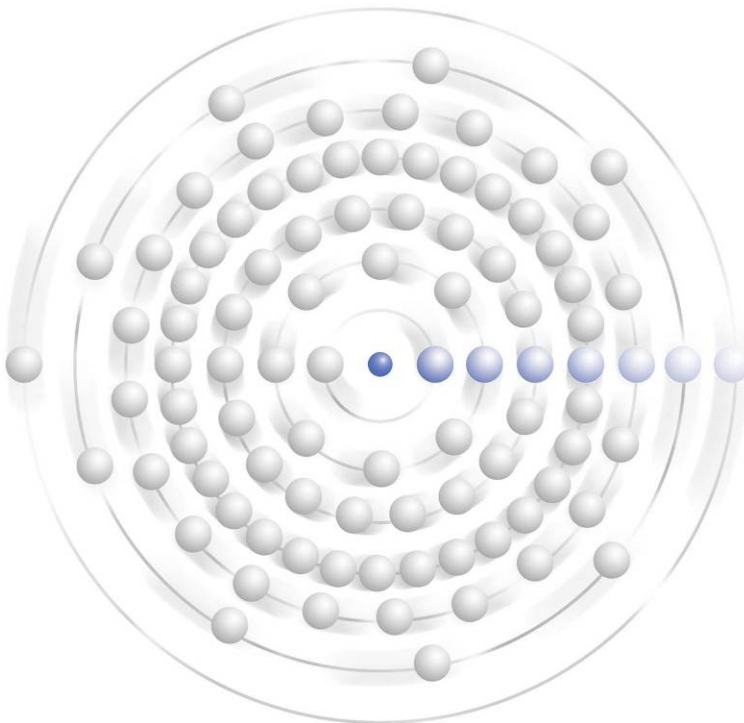




## Nuclear Power Outlook



*A service of*



**Ux Consulting**  
1401 Macy Drive  
Roswell, GA 30076  
(770) 642-7745  
[www.uxc.com](http://www.uxc.com)

**– NOTICE –**

The Ux Consulting Company, LLC (“UxC”) shall have title to, ownership of, and all proprietary rights in this Report. Under United States federal copyright law (17 USC 101 et seq.) it is illegal to reproduce this Report by any means without written permission from UxC.

The information contained in this Report is obtained from sources that UxC believes to be reliable. UxC makes no warranty or representation, express or implied, with respect to the accuracy, completeness or usefulness of the information contained in this Report and UxC, to the maximum extent permitted by law, assumes no liability for the use or effects of any of the information or data contained in this Report.

It is UxC’s strict policy not to endorse, promote, or recommend any particular securities, currencies, or other financial products or instruments. Nothing contained in this Report is intended to constitute investment, legal, tax, accounting or other professional advice and the reader should not rely on the information provided in this Report for making financial decisions.

# Table of Contents

<b>1 – Essay: Nuclear Energy Prospects in the Middle East</b>	<b>8</b>
GWU Project Compendium Report	9
Overview of the Middle East Region	9
History of Nuclear Energy in the Middle East	11
Rationales for Middle East Nuclear Power	11
Energy Diversification	11
Water Desalination	12
Financial Wherewithal	12
Expanding Technological Progress	12
Regional Collaboration and Competition	13
Aggressive Marketing by International Suppliers	13
Impediments to Middle East Nuclear Power	14
Regional and Geopolitics	14
Nonproliferation Concerns	14
Bilateral Trade Issues	16
Human Resources and Infrastructure Constraints	16
Selected Country Profiles	17
Turkey	17
United Arab Emirates	18
Jordan	18
Egypt	19
Iran	19
Saudi Arabia	20
Israel	21
Strategic Analysis of Middle East Nuclear Power	21
UxC Forecasts for Middle East Nuclear Power	25
Summary and Conclusions	27
<b>2 – Highlights of Worldwide Reactor Developments</b>	<b>28</b>
Key Reactor Developments by Region	29
North America	29
Western Europe	30
Eastern Europe	31
Asia & Oceania	33
Africa & Middle East	34
South America	35
<b>3 – Regional &amp; Country Summaries</b>	<b>36</b>
North America	36
North America Overall Reactor Forecast	36
Canada	37
United States	40
Mexico	58
Western Europe	59
Western Europe Overall Reactor Forecast	59
France	60
United Kingdom	62
Germany	64
Sweden	66
Finland	67
Spain	69
Switzerland	70
Belgium	71
Netherlands	72
Italy	73
Portugal	74
Norway	75

Ireland.....	76
Eastern Europe .....	77
Eastern Europe Overall Reactor Forecast.....	77
Russia.....	78
Ukraine .....	85
Czech Republic .....	88
Slovakia .....	90
Hungary .....	92
Bulgaria .....	94
Romania .....	97
Slovenia.....	99
Croatia .....	100
Serbia .....	101
Macedonia .....	102
Albania.....	103
Lithuania.....	104
Latvia.....	107
Estonia.....	108
Poland .....	109
Belarus .....	112
Armenia .....	115
Azerbaijan.....	117
Georgia.....	119
Asia & Oceania.....	120
Asia & Oceania Overall Reactor Forecast.....	120
Japan.....	121
South Korea.....	123
China .....	125
Taiwan .....	128
India.....	130
Pakistan.....	133
Kazakhstan.....	134
Indonesia.....	136
Thailand.....	138
Vietnam .....	139
Malaysia .....	140
Singapore .....	141
Philippines .....	142
Bangladesh.....	143
Sri Lanka .....	144
Australia.....	145
New Zealand .....	146
North Korea .....	147
Africa & Middle East.....	148
Africa & Middle East Overall Reactor Forecast .....	148
South Africa .....	149
Namibia .....	151
Tanzania.....	152
Kenya .....	153
Uganda.....	154
Ghana.....	155
Nigeria .....	156
Cape Verde .....	157
Morocco.....	158
Algeria .....	159
Tunisia.....	160
Libya.....	161
Egypt .....	162
Jordan.....	163
Israel.....	165
Syria .....	166

Turkey .....	167
Gulf States.....	168
United Arab Emirates .....	170
Yemen.....	172
Iran .....	173
South America.....	174
South America Overall Reactor Forecast.....	174
Brazil .....	175
Argentina.....	176
Chile .....	177
Venezuela .....	178
Uruguay.....	179
<b>4 – Global Nuclear Power Forecast through 2030</b> .....	<b>180</b>
Current Base Case Global Reactor Forecast.....	180
Detailed Global Reactor Forecast, 2008-2030 .....	182
Summary of Reactor Forecast Changes since Last Report.....	183
Changes to Operating Units .....	183
Changes to New Reactor Plans .....	183
Data on Latest Base Case Forecast Changes .....	184
Alternative UxC Reactor Forecast Cases .....	185
Reactor Forecast Case Comparisons .....	186
<b>Appendix A – Statistical Review</b> .....	<b>188</b>
Currently Operating Reactors .....	188
Reactors Under or Near Construction.....	198
New Reactor Startups by Year, 2009-2020.....	201
Estimated New Reactor Startups by Year, 2021-2030.....	202
Reactor Capacities Anticipated by 2030 by Country.....	203
Regional and Country Distributions and Rankings.....	205
World Map of Nuclear Power Countries .....	205
Regional Distribution of Operating Reactors .....	206
Regional Distribution of New Reactors, 2009-2020 .....	207
Country Distribution of New Reactors, 2009-2020 .....	208
Regional Distribution of New Reactors, 2021-2030 .....	209
Country Distribution of New Reactors, 2021-2030 .....	210
Top Ten Country Rankings .....	211
Reactor Shutdown Data, 2009-2030.....	212
Statistics on Reactor Technologies and Vendors .....	214

## List of Figures

Figure 1. Map of Middle East .....	9
Figure 2. Middle East Nuclear Power Growth Cases, 2008-2030 .....	25
Figure 3. Base Case Middle East Nuclear Power Forecast, 2008-2030 .....	26
Figure 4. Map of NPO Countries by Region.....	28
Figure 5. North America Reactor & Nuclear Capacity Forecast, 2008-2030.....	36
Figure 6. Western Europe Reactor & Nuclear Capacity Forecast, 2008-2030 .....	59
Figure 7. Eastern Europe Reactor & Nuclear Capacity Forecast, 2008-2030 .....	77
Figure 8. Asia & Oceania Reactor & Nuclear Capacity Forecast, 2008-2030 .....	120
Figure 9. Africa & Middle East Reactor & Nuclear Capacity Forecast, 2008-2030.....	148
Figure 10. South America Reactor & Nuclear Capacity Forecast, 2008-2030 .....	174
Figure 11. UxC Nuclear Generating Capacity Overview Forecast, 2008-2030 .....	181
Figure 12. Nuclear Generating Capacity Percentages by Region, 2008 vs. 2020 vs. 2030.....	181
Figure 13. UxC World Detailed Reactor & Nuclear Capacity Forecast, 2008-2030 .....	182
Figure 14. UxC Base, High, and Low Case Nuclear Capacity Forecasts, 2008-2030.....	185

Figure 15. UxC Base Case Nuclear Capacity Forecasts, 2008-2030 .....	186
Figure 16. UxC High Case Nuclear Capacity Forecasts, 2008-2030 .....	186
Figure 17. UxC Low Case Nuclear Capacity Forecasts, 2008-2030 .....	187
Figure A-1. New Reactor Startups and Total MWe Added, 2009-2020 .....	202
Figure A-2. New Reactor Startups and Total MWe Added, 2021-2030 .....	202
Figure A-3. World Map of Nuclear Power Countries .....	205
Figure A-4. Percentage of Operating Units by Region .....	206
Figure A-5. Percentage of Operating Nuclear Capacity by Region .....	206
Figure A-6. Percentage of New Units by Region, 2009-2020 .....	207
Figure A-7. Percentage of New Nuclear Capacity by Region .....	207
Figure A-8. Percentage of New Units by Country, 2009-2020 .....	208
Figure A-9. Percentage of New Nuclear Capacity by Country, 2009-2020 .....	209
Figure A-10. Percentage of New Units by Region, 2021-2030 .....	209
Figure A-11. Percentage of New Nuclear Capacity by Region, 2021-2030 .....	210
Figure A-12. Percentage of New Units by Country, 2020-2030 .....	210
Figure A-13. Percentage of New Nuclear Capacity by Country, 2020-2030 .....	211
Figure A-14. Reactor Shutdowns by Region, 2009-2020 .....	212
Figure A-15. Reactor Shutdowns and Lost Nuclear Capacity by Year, 2009-2020 .....	212
Figure A-16. Reactor Shutdowns by Region, 2021-2030 .....	213
Figure A-17. Reactor Shutdowns and Lost Nuclear Capacity by Year, 2021-2030 .....	213
Figure A-18. Percentages of Different Operating Reactor Types .....	214
Figure A-19. Percentages of New Reactor Types, 2009-2020 .....	215
Figure A-20. Percentages of New Reactor Vendors, 2009-2020 .....	215

## List of Tables

Table 1. Key Data on Potential Middle East Nuclear Power Countries .....	10
Table 2. Middle East Country Matrix 1: Economic and Energy Drivers .....	22
Table 3. Middle East Country Matrix 2: Preparation for Nuclear Deployment .....	23
Table 4. UxC Reactor Forecast Cases for Middle East Region, 2020 & 2030 .....	25
Table 5. UxC Reactor Forecast Case Data for Middle East Countries by 2030 .....	26
Table 6. North America Reactor & Nuclear Capacity Forecast, 2008-2020 .....	37
Table 7. Canada Nuclear & Electric Power Data .....	37
Table 8. Canada Reactor Forecast, 2008-2020 .....	40
Table 9. United States Nuclear & Electric Power Data .....	40
Table 10. U.S. New Reactor Licensing Status and Plans .....	42
Table 11. U.S. Reactor Design Certification Status .....	51
Table 12. United States Reactor Forecast, 2008-2020 .....	57
Table 13. Mexico Nuclear & Electric Power Data .....	58
Table 14. Western Europe Reactor & Nuclear Capacity Forecast, 2008-2020 .....	60
Table 15. France Nuclear & Electric Power Data .....	60
Table 16. France Reactor Forecast, 2008-2020 .....	62
Table 17. United Kingdom Nuclear & Electric Power Data .....	62
Table 18. United Kingdom Reactor Forecast, 2008-2020 .....	64
Table 19. Germany Nuclear & Electric Power Data .....	64
Table 20. Sweden Nuclear & Electric Power Data .....	66
Table 21. Sweden Reactor Forecast, 2008-2020 .....	67
Table 22. Finland Nuclear & Electric Power Data .....	67
Table 23. Finland Reactor Forecast, 2008-2020 .....	68
Table 24. Spain Nuclear & Electric Power Data .....	69
Table 25. Spain Reactor Forecast, 2008-2020 .....	70

Table 26. Switzerland Nuclear & Electric Power Data .....	70
Table 27. Switzerland Reactor Forecast, 2008-2020 .....	71
Table 28. Belgium Nuclear & Electric Power Data .....	71
Table 29. Belgium Reactor Forecast, 2008-2020.....	72
Table 30. Netherlands Nuclear & Electric Power Data.....	72
Table 31. Italy Nuclear & Electric Power Data .....	73
Table 32. Portugal Nuclear & Electric Power Data.....	74
Table 33. Norway Nuclear & Electric Power Data .....	75
Table 34. Ireland Nuclear & Electric Power Data .....	76
Table 35. Eastern Europe Reactor & Nuclear Capacity Forecast, 2008-2020 .....	77
Table 36. Russia Nuclear & Electric Power Data .....	78
Table 37. Russia Reactor Forecast, 2008-2020.....	84
Table 38. Ukraine Nuclear & Electric Power Data.....	85
Table 39. Ukraine Reactor Forecast, 2008-2020 .....	87
Table 40. Czech Republic Nuclear & Electric Power Data.....	88
Table 41. Czech Republic Reactor Forecast, 2008-2020 .....	90
Table 42. Slovakia Nuclear & Electric Power Data .....	90
Table 43. Slovakia Reactor Forecast, 2008-2020 .....	92
Table 44. Hungary Nuclear & Electric Power Data .....	92
Table 45. Bulgaria Nuclear & Electric Power Data.....	94
Table 46. Bulgaria Reactor Forecast, 2008-2020 .....	96
Table 47. Romania Nuclear & Electric Power Data.....	97
Table 48. Romania Reactor Forecast, 2008-2020 .....	98
Table 49. Slovenia Nuclear & Electric Power Data .....	99
Table 50. Croatia Nuclear & Electric Power Data .....	100
Table 51. Serbia Nuclear & Electric Power Data.....	101
Table 52. Macedonia Nuclear & Electric Power Data .....	102
Table 53. Albania Nuclear & Electric Power Data .....	103
Table 54. Lithuania Nuclear & Electric Power Data .....	104
Table 55. Lithuania Reactor Forecast, 2008-2020 .....	107
Table 56. Latvia Nuclear & Electric Power Data .....	107
Table 57. Estonia Nuclear & Electric Power Data .....	108
Table 58. Poland Nuclear & Electric Power Data.....	109
Table 59. Belarus Nuclear & Electric Power Data.....	112
Table 60. Armenia Nuclear & Electric Power Data.....	115
Table 61. Azerbaijan Nuclear & Electric Power Data .....	117
Table 62. Georgia Nuclear & Electric Power Data .....	119
Table 63. Asia & Oceania Reactor & Nuclear Capacity Forecast, 2008-2020 .....	120
Table 64. Japan Nuclear & Electric Power Data .....	121
Table 65. Japan Reactor Forecast, 2008-2020.....	123
Table 66. South Korea Nuclear & Electric Power Data .....	123
Table 67. South Korea Reactor Forecast, 2008-2020.....	125
Table 68. China Nuclear & Electric Power Data.....	125
Table 69. China Reactor Forecast, 2008-2020 .....	128
Table 70. Taiwan Nuclear & Electric Power Data .....	128
Table 71. India Nuclear & Electric Power Data .....	130
Table 72. India Reactor Forecast, 2008-2020.....	132
Table 73. Pakistan Nuclear & Electric Power Data .....	133
Table 74. Kazakhstan Nuclear & Electric Power Data .....	134
Table 75. Indonesia Nuclear & Electric Power Data .....	136
Table 76. Thailand Nuclear & Electric Power Data .....	138
Table 77. Vietnam Nuclear & Electric Power Data.....	139

Table 78. Malaysia Nuclear & Electric Power Data .....	140
Table 79. Singapore Nuclear & Electric Power Data .....	141
Table 80. Philippines Nuclear & Electric Power Data .....	142
Table 81. Bangladesh Nuclear & Electric Power Data.....	143
Table 82. Sri Lanka Nuclear & Electric Power Data .....	144
Table 83. Australia Nuclear & Electric Power Data.....	145
Table 84. New Zealand Nuclear & Electric Power Data .....	146
Table 85. North Korea Nuclear & Electric Power Data .....	147
Table 86. Africa & Middle East Reactor & Nuclear Capacity Forecast, 2008-2020 .....	148
Table 87. South Africa Nuclear & Electric Power Data .....	149
Table 88. South Africa Reactor Forecast, 2008-2020.....	150
Table 89. Namibia Nuclear & Electric Power Data .....	151
Table 90. Tanzania Nuclear & Electric Power Data.....	152
Table 91. Kenya Nuclear & Electric Power Data .....	153
Table 92. Uganda Nuclear & Electric Power Data .....	154
Table 93. Ghana Nuclear & Electric Power Data.....	155
Table 94. Nigeria Nuclear & Electric Power Data .....	156
Table 95. Cape Verde Nuclear & Electric Power Data .....	157
Table 96. Morocco Nuclear & Electric Power Data.....	158
Table 97. Algeria Nuclear & Electric Power Data .....	159
Table 98. Tunisia Nuclear & Electric Power Data .....	160
Table 99. Libya Nuclear & Electric Power Data .....	161
Table 100. Egypt Nuclear & Electric Power Data .....	162
Table 101. Jordan Nuclear & Electric Power Data.....	163
Table 102. Israel Nuclear & Electric Power Data.....	165
Table 103. Syria Nuclear & Electric Power Data .....	166
Table 104. Turkey Nuclear & Electric Power Data.....	167
Table 105. Gulf States Nuclear & Electric Power Data.....	168
Table 106. UAE Nuclear & Electric Power Data .....	170
Table 107. Yemen Nuclear & Electric Power Data .....	172
Table 108. Iran Nuclear & Electric Power Data .....	173
Table 109. South America Reactor & Nuclear Capacity Forecast, 2008-2020 .....	174
Table 110. Brazil Nuclear & Electric Power Data.....	175
Table 111. Argentina Nuclear & Electric Power Data .....	176
Table 112. Chile Nuclear & Electric Power Data .....	177
Table 113. Venezuela Nuclear & Electric Power Data.....	178
Table 114. Uruguay Nuclear & Electric Power Data .....	179
Table 115. Global Nuclear Power 2008 vs. 2015, 2020, and 2030.....	180
Table 116. World Reactor & Nuclear Capacity Forecast, 2008-2020 .....	182
Table 117. Changes in Selected Country Nuclear Power Forecasts for 2020.....	184
Table 118. Changes in Selected Country Nuclear Power Forecasts for 2030.....	184
Table 119. UxC Base, High, and Low Case Nuclear Reactor and Capacity Forecasts, 2008-2020 .....	185
Table 120. Growth Rate Data Comparisons for UxC Reactor Forecast Cases .....	187
Table A-1. Worldwide Reactors in Operation by Country .....	188
Table A-2. Worldwide Reactors Under or Near Construction by Year, 2008-2020 .....	198
Table A-3. New Reactor Startups by Year, 2009-2020.....	201
Table A-4. New Reactor Startups by Year, 2021-2030.....	202
Table A-5. Reactor Units & Nuclear Capacities Anticipated by Country by 2030 .....	203
Table A-6. Regional Breakdown for Operating Reactors.....	206
Table A-7. Regional Breakdown for New Reactors, 2009-2020 .....	207
Table A-8. Country Breakdown for New Reactors, 2009-2020 .....	208
Table A-9. Regional Breakdown for New Reactors, 2021-2030 .....	209

Table A-10. Country Breakdown for New Reactors, 2021-2030 .....	210
Table A-11. Top Ten Nuclear Countries, 2008.....	211
Table A-12. Top Ten Nuclear Countries, 2015.....	211
Table A-13. Top Ten Nuclear Countries, 2020.....	211
Table A-14. Top Ten Nuclear Countries, 2030.....	211
Table A-15. Regional Breakdown for Reactor Shutdowns, 2009-2020 .....	212
Table A-16. Regional Breakdown for Reactor Shutdowns, 2021-2030 .....	213
Table A-17. Operating Reactor Types .....	214
Table A-18. New Reactor Types, 2009-2020 .....	214
Table A-19. New Reactor Vendors, 2009-2020 .....	215