



Small, Advanced, and Micro Reactor Assessments



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Table of Contents

Introduction and Overview	14
UxC SAMR Credentials.....	14
Purpose of Report.....	15
Structure of Report.....	16
1 – SAMR Market Overview	18
Defining SAMRs.....	18
SAMR vs SMR.....	18
Small Reactors.....	18
Modular Reactors.....	18
Advanced Reactors.....	19
High-Temperature, Gas-Cooled Reactors.....	19
Liquid Metal Reactors.....	20
Molten Salt Reactors.....	20
Pool-Type Reactors.....	20
Micro Reactors.....	21
Land-Based vs. Floating Reactors.....	21
Why SAMRs and Why Now?.....	22
Why SAMRS?.....	22
Overview of SAMR Advantages.....	22
Sized to Grow.....	24
Operational Flexibility.....	25
High Efficiency.....	25
Enhanced Safety.....	25
Rapid Deployment.....	26
Economics.....	26
Why Now?.....	27
Key Country Reviews.....	29
United States.....	29
Canada.....	31
United Kingdom.....	32
France.....	33
Russia.....	34
China.....	35
Japan.....	36
South Korea.....	37
Other Countries.....	37
Argentina.....	37
Czechia.....	38
Netherlands.....	38
Poland.....	38
Romania.....	39
Saudi Arabia.....	39
Sweden.....	39
Additional Countries to Watch.....	40
A Market in Constant Flux.....	41
2 – Profiles of Leading SAMR Designs	42
UxC Selection Process for Leading Designs.....	42
Summary of Leading Designs.....	44
Argentina – CAREM (CNEA).....	45
Developer Overview and History.....	45
Reactor Technology Highlights.....	45
Target Markets and Applications.....	46
Economics.....	46
Deployment Status.....	46
Financing.....	47
Government Support.....	47
Licensing.....	47
Siting.....	47

Construction and Supply Chain.....	47
Industry Partnerships.....	48
Fuel Cycle Considerations.....	48
Analysis.....	48
Canada – ARC-100 (ARC Clean Technology).....	50
Developer Overview and History.....	50
Reactor Technology Highlights.....	50
Target Markets and Applications.....	51
Economics.....	51
Deployment Status.....	51
Financing.....	51
Government Support.....	52
Licensing.....	52
Siting.....	53
Construction and Supply Chain.....	54
Industry Partnerships.....	54
Fuel Cycle Considerations.....	54
Analysis.....	55
Canada – SSR-W (Moltex Energy).....	57
Developer Overview and History.....	57
Reactor Technology Highlights.....	57
Target Markets and Applications.....	58
Economics.....	58
Deployment Status.....	58
Financing.....	59
Government Support.....	59
Licensing.....	60
Siting.....	60
Construction and Supply Chain.....	60
Industry Partnerships.....	61
Fuel Cycle Considerations.....	61
Analysis.....	61
Canada – IMSR (Terrestrial Energy).....	63
Developer Overview and History.....	63
Reactor Technology Highlights.....	63
Target Markets and Applications.....	64
Economics.....	64
Deployment Status.....	64
Financing.....	65
Government Support.....	65
Licensing.....	65
Siting.....	66
Construction and Supply Chain.....	66
Industry Partnerships.....	67
Fuel Cycle Considerations.....	67
Analysis.....	68
China – ACPR50S (CGN).....	70
Developer Overview and History.....	70
Reactor Technology Highlights.....	70
Target Markets and Applications.....	71
Economics.....	71
Deployment Status.....	71
Financing.....	72
Government Support.....	72
Licensing.....	73
Siting.....	73
Construction and Supply Chain.....	73
Industry Partnerships.....	74
Fuel Cycle Considerations.....	74
Analysis.....	74
China – ACP100 (CNNC).....	76
Developer Overview and History.....	76
Reactor Technology Highlights.....	76
Target Markets and Applications.....	77

Economics	77
Deployment Status	77
Financing	78
Government Support	78
Licensing	78
Siting	79
Construction and Supply Chain	79
Industry Partnerships	79
Fuel Cycle Considerations	79
Analysis	80
China – DHR-400 (CNNC/CIAE)	81
Developer Overview and History	81
Reactor Technology Highlights	81
Target Markets and Applications	82
Economics	82
Deployment Status	82
Financing	83
Government Support	83
Licensing	83
Siting	83
Construction and Supply Chain	84
Industry Partnerships	84
Fuel Cycle Considerations	84
Analysis	84
China – HAPPY200 (SPIC/SNERDI)	86
Developer Overview and History	86
Reactor Technology Highlights	86
Target Markets and Applications	87
Economics	87
Deployment Status	87
Financing	88
Government Support	88
Licensing	88
Siting	88
Construction and Supply Chain	89
Industry Partnerships	89
Fuel Cycle Considerations	89
Analysis	89
China – HTR-PM 200 (Tsinghua-INET/CHG/CNNC)	91
Developer Overview and History	91
Reactor Technology Highlights	91
Target Markets and Applications	92
Economics	92
Deployment Status	92
Financing	93
Government Support	93
Licensing	93
Siting	94
Construction and Supply Chain	94
Industry Partnerships	95
Fuel Cycle Considerations	95
Analysis	95
France – NUWARD (EDF)	97
Developer Overview and History	97
Reactor Technology Highlights	97
Target Markets and Applications	98
Economics	99
Deployment Status	99
Financing	99
Government Support	99
Licensing	99
Siting	100
Construction and Supply Chain	100
Industry Partnerships	101

Fuel Cycle Considerations	101
Analysis	102
Russia – SVBR-100 (JSC AKME Engineering)	103
Developer Overview and History	103
Reactor Technology Highlights	103
Target Markets and Applications	104
Economics	104
Deployment Status	105
Financing	105
Government Support	105
Licensing	106
Siting	106
Construction and Supply Chain	106
Industry Partnerships	107
Fuel Cycle Considerations	107
Analysis	107
Russia – RITM-200N (OKBM Afrikantov)	109
Developer Overview and History	109
Reactor Technology Highlights	109
Target Markets and Applications	110
Economics	110
Deployment Status	111
Financing	111
Government Support	112
Licensing	112
Siting	113
Construction and Supply Chain	113
Industry Partnerships	113
Fuel Cycle Considerations	113
Analysis	114
Russia – BREST-OD-300 (NIKIET)	116
Developer Overview and History	116
Reactor Technology Highlights	116
Target Markets and Applications	117
Economics	118
Deployment Status	118
Financing	118
Government Support	119
Licensing	119
Siting	119
Construction and Supply Chain	120
Industry Partnerships	120
Fuel Cycle Considerations	121
Analysis	122
South Korea – SMART (KAERI)	124
Developer Overview and History	124
Reactor Technology Highlights	124
Target Markets and Applications	125
Economics	125
Deployment Status	125
Financing	125
Government Support	126
Licensing	126
Siting	126
Construction and Supply Chain	126
Industry Partnerships	127
Fuel Cycle Considerations	127
Analysis	127
U.K. – Rolls-Royce SMR (Rolls-Royce)	129
Developer Overview and History	129
Reactor Technology Highlights	129
Target Markets and Applications	130
Economics	130
Deployment Status	130

Financing.....	131
Government Support	131
Licensing	132
Siting	132
Construction and Supply Chain	133
Industry Partnerships.....	134
Fuel Cycle Considerations.....	134
Analysis	134
U.S. – BANR Microreactor (BWXT, Inc.).....	136
Developer Overview and History	136
Reactor Technology Highlights	136
Target Markets and Applications	137
Economics	137
Deployment Status	137
Financing.....	138
Government Support	138
Licensing	138
Siting	139
Construction and Supply Chain	139
Industry Partnerships.....	140
Fuel Cycle Considerations.....	140
Analysis	141
U.S. – BWRX-300 (GE-Hitachi)	143
Developer Overview and History	143
Reactor Technology Highlights	143
Target Markets and Applications	144
Economics	144
Deployment Status	144
Financing.....	145
Government Support	145
Licensing	146
Siting	146
Construction and Supply Chain	146
Industry Partnerships.....	147
Fuel Cycle Considerations.....	147
Analysis	147
U.S. – SMR-160 (Holtec International).....	149
Developer Overview and History	149
Reactor Technology Highlights	149
Target Markets and Applications	150
Economics	150
Deployment Status	150
Financing.....	152
Government Support	152
Licensing	153
Siting	154
Construction and Supply Chain	155
Industry Partnerships.....	155
Fuel Cycle Considerations.....	156
Analysis	156
U.S. – KP-FHR (Kairos Power).....	158
Developer Overview and History	158
Reactor Technology Highlights	158
Target Markets and Applications	159
Economics	159
Deployment Status	160
Financing.....	160
Government Support	160
Licensing	161
Siting	161
Construction and Supply Chain	161
Industry Partnerships.....	162
Fuel Cycle Considerations.....	163
Analysis	163

U.S. – PWR-20 (Last Energy) 165

- Developer Overview and History 165
- Reactor Technology Highlights 165
- Target Markets and Applications 166
- Economics..... 166
- Deployment Status 166
 - Financing 167
 - Government Support..... 167
 - Licensing..... 167
 - Siting 168
 - Construction and Supply Chain..... 168
 - Industry Partnerships 168
- Fuel Cycle Considerations 169
- Analysis..... 169

U.S. – VOYGR (NuScale Power) 171

- Developer Overview and History 171
- Reactor Technology Highlights 171
- Target Markets and Applications 172
- Economics..... 172
- Deployment Status 173
 - Financing 173
 - Government Support..... 173
 - Licensing..... 174
 - Siting 175
 - Construction and Supply Chain..... 175
 - Industry Partnerships 175
- Fuel Cycle Considerations 176
- Analysis..... 176

U.S. – Aurora (Oklo Inc.) 178

- Developer Overview and History 178
- Reactor Technology Highlights 178
- Target Markets and Applications 179
- Economics..... 179
- Deployment Status 180
 - Financing 180
 - Government Support..... 181
 - Licensing..... 182
 - Siting 182
 - Construction and Supply Chain..... 182
 - Industry Partnerships 183
- Fuel Cycle Considerations 183
- Analysis..... 184

U.S. – Natrium (TerraPower)..... 186

- Developer Overview and History 186
- Reactor Technology Highlights 186
- Target Markets and Applications 187
- Economics..... 187
- Deployment Status 187
 - Financing 187
 - Government Support..... 188
 - Licensing..... 188
 - Siting 188
 - Construction and Supply Chain..... 189
 - Industry Partnerships 190
- Fuel Cycle Considerations 190
- Analysis..... 191

U.S. – MMR (Ultra Safe Nuclear Corp.) 192

- Developer Overview and History 192
- Reactor Technology Highlights 192
- Target Markets and Applications 193
- Economics..... 193
- Deployment Status 193
 - Financing 194
 - Government Support..... 194

Licensing	195
Siting	195
Construction and Supply Chain	196
Industry Partnerships	196
Fuel Cycle Considerations	197
Analysis	198
U.S. – Xe-100 (X-energy).....	200
Developer Overview and History	200
Reactor Technology Highlights	200
Target Markets and Applications	201
Economics	201
Deployment Status	201
Financing	202
Government Support	202
Licensing	203
Siting	203
Construction and Supply Chain	203
Industry Partnerships	203
Fuel Cycle Considerations	204
Analysis	204
3 – Additional SAMR Designs	206
Denmark – CMSR (Seaborg Technologies).....	207
Germany – DF300 (Dual Fluid)	208
Russia – SHELF-M (NIKIET)	209
Sweden – SEALER-55 (LeadCold)	210
U.K. – FLEX (MoltexFLEX)	211
U.K. – Mini/Small LFR (Newcleo).....	212
U.S. – EM ² (General Atomics).....	213
U.S. – FMR (General Atomics)	214
U.S. – Holos Quad (HolosGen).....	215
U.S. – Kaleidos (Radiant Nuclear)	216
U.S. – MCFR (TerraPower/Southern)	217
U.S. – AP300 (Westinghouse)	218
U.S. – eVinci (Westinghouse)	219
U.S. – Xe-Mobile (X-energy).....	220
Additional SAMR Designs	221
4 – Active and Proposed SAMR Projects	224
Operating SAMRs	224
China – Shidaowan HTR-PM Demonstration Project	224
India – Kalpakkam Fast Breeder Test Reactor	224
Russia – <i>Akademik Lomonosov</i>	225
Russia – BN-600/BN-800	225
Under Construction Projects	226
Argentina – CAREM-25 SMR Pilot	226
China – Changjiang ACP100 Demonstration.....	226
China – Xiapu CFR-600s.....	226
India – Kalpakkam Prototype FBR	227
Russia – Seversk BREST-OD-300	227
Advanced Development Projects	228
Canada – Darlington SMR Project.....	228
Canada – GFP Chalk River MMR Project.....	228
Canada – NB Power-ARC PLNGS SMR Project	228
Canada – NB Power-Moltex Energy PLNGS SMR Project.....	228
China – Xiapu HTR-600.....	229
China – Jiangsu Xuwei HTR-600 Nuclear Energy Heating Project.....	229
France – Newcleo Mini LFR Project	229
France – NUWARD Demonstration Project	229
Poland – OSGE Poland SMR Demonstration Project (Stawy Monowskie)	229
Poland – OSGE Poland SMR Demonstration Project (Włocławek)	230

Russia – Yakutia SMR Demonstration Project	230
South Korea – SMART/i-SMR SMR Demonstration Project.....	230
U.S. – Carbon Free Power Project (CFPP)	230
U.S. – Dow and X-energy Seadrift Project	230
U.S. – MCRE/MCFR	231
U.S. – Kemmerer Sodium Demonstration Project.....	231
U.S. – DoD Project Pele Microreactor Demonstration Project.....	231
U.S. – Kairos Power Hermes 1 & 2 Demonstration Projects	232
U.S. – TVA New Nuclear Clinch River SMR Demonstration Project	232
U.S. – Oklo Aurora Powerhouse Demonstration Project.....	232
Planned Projects	233
Canada – ARC BPA SMR Project.....	233
Canada – USNC McMaster University MMR Project.....	233
China – Jiamusi Nuclear Heating Demonstration Project.....	233
Czech Republic – Temelin SMR Project	234
Czech Republic – Dětmarovice SMR Project.....	234
Czech Republic – Tušimice SMR Project.....	234
Estonia – Fermi Energia Baltic SMR Project	234
Indonesia – PT ThorCon Indonesia Project.....	234
Indonesia – Pupuk Kaltim SMR Project.....	235
Poland – KGHM NuScale SMR Project.....	235
Poland – OSGE Dąbrowa Górnicza SMR Project	235
Poland – OSGE Kraków-Nowa Huta SMR Project.....	235
Poland – OSGE Ostrołęka SMR Project	235
Poland – OSGE Tarnobrzeg SEZ SMR Project	235
Poland – OSGE Warsaw SMR Project.....	236
Poland – USNC Grupa Azoty Police Project	236
Poland – Last Energy Enea SMR Project.....	236
Poland – Last Energy LSEZ/DB Energy SMR Project.....	236
Romania – Doicești NuScale SMR Project.....	236
Romania – Last Energy Mioveni SMR Project	237
Russia – Dimitrovgrad SVBR-100 Project	237
Russia – Baimsky OFPU Project.....	237
Russia – BN-1200	237
Sweden – LeadCold SEALER-E Demonstration Project.....	237
U.S. – USNC University of Illinois MMR Project.....	237
U.S. – Dominion Virginia SMR Project	238
U.S. – Duke Energy Belews Creek SMR Project	238
U.S. – Surry Green Energy Center Project.....	238
U.S. – PacifiCorp Utah Sodium Project.....	238
U.S. – Oklo SODI Project.....	239
U.S. – Oklo Eielson AFB Project	239
U.S. – X-energy/ENW SMR Project	239
UK – Last Energy UK SMR Project	239
UK – Newcleo Small LFR Project.....	239
Prospective Projects.....	240
List of All Known SAMR Projects	242
SAMR Projects by Status	242
SAMR Projects by Country.....	243
SAMR Projects by Vendor.....	244
Full SAMR Project List	245
5 – SAMR Market Analysis	251
Evaluating Future SAMR Prospects.....	251
Electricity Demand Growth within the Energy Transition.....	251
Non-Electrical/Non-Traditional Applications	254
Site/Industry-Specific Energy Needs.....	254
Coal-to-Nuclear Transition	255
Process Heat.....	256
District Heating.....	256
Hydrogen and/or Ammonia Production	256
Desalination	257
Microgrids	257
Military.....	258
Marine Propulsion	258

Government Promotional Policies.....	259
Direct Funding / Tax Incentives / Power Purchase Agreements.....	259
Fuel Supply Support & Assurances.....	260
Support for Suppliers.....	260
Siting.....	260
Regulation & Licensing.....	260
Export Promotion & Financing.....	261
In-Kind Support.....	262
Challenges to Deployment.....	262
Regulatory Uncertainty.....	262
International Regulatory Disharmony.....	262
Protracted Regulatory Reviews.....	263
Site Specific Issues.....	264
Cost and Schedule.....	265
Supply Chain/Fuel Cycle.....	266
Spent Nuclear Fuel and Decommissioning.....	267
Lessons from the SAMR Graveyard.....	268
Over-Promise + Under-Deliver = Undertaker.....	268
Endurance is Key: SAMR Deployment is a Long-Term Game.....	269
Timing is Everything.....	270
The Complexity Trap.....	271
Summary.....	271
6 – SAMR Market Projections.....	272
Global SAMR Market Landscape.....	273
Global SAMR Funding Commitments.....	274
Global SAMR Reactor Forecasts.....	275
Global SAMR Forecast Scenarios.....	276
Most Probable “Base” Scenario.....	278
Forecast by Region.....	278
Base Case Details by Country.....	279
High Deployment Scenario.....	280
Forecast by Region.....	280
Low Deployment Scenario.....	281
Forecast by Region.....	281
SAMRs’ Position in Nuclear Power’s Future.....	282
Base Case.....	283
High Case.....	283
Low Case.....	284
Global SAMR Market Size Estimates.....	285
Development Costs.....	285
Construction Costs.....	286
Operating Costs.....	287
Total Market Size Estimates.....	288
Base Case Global Market Size Detail.....	289
Total Market Size in Real (Constant) Dollars.....	290
Non-Electrical Applications Market Estimates.....	291
District Heating.....	291
Process Heat.....	291
Hydrogen.....	292
Desalination.....	292
Summary.....	292
7 – Summary and Conclusions.....	293
Summary of Key Data.....	293
SAMR Designs.....	293
SAMR Projects.....	293
SAMR Forecasts.....	293
SAMR Financial Commitments.....	294
SAMR Market Size Estimates.....	294
Who are the Leaders, and Why?.....	295
Leaders.....	296
On The Bubble.....	299
The Bottom Line.....	301

Financing.....	301
Regulatory.....	301
Policy Support.....	301
Public Support.....	302
Competing Technologies.....	302
Success of FOAK Demonstration Projects.....	302
Black Swan Events.....	302
Final Thoughts.....	303
Appendix A – UxC Nuclear Market Regions	304
Appendix B – Review of U.S. Government SAMR Programs	305
ARDP.....	305
GAIN.....	306
Other DOE Programs.....	307
DOE Loan Guarantees.....	307
Nuclear-Related Tax Credits.....	307
DOS FIRST Initiative.....	308
DoD Projects.....	308
Appendix C – SAMR Design List	309
Appendix D – SAMR Vendor/Design Websites	313
Appendix E – SAMR Related Reports and Other Resources	316
International Organizations.....	316
Government Organizations.....	317
Others.....	318
Glossary	319

List of Figures

Figure 1. SMR Economic Drivers Compensating for Diseconomies of Scale	23
Figure 2. CAREM-25 Plant Depiction and Reactor Overview	45
Figure 3. ARC-100 Plant Depiction and Reactor Overview	50
Figure 4. SSR-W Plant Depiction and Reactor Overview	57
Figure 5. IMSR Plant Depiction and Reactor Overview	63
Figure 6. ACPR50S Plant Depiction and Reactor Overview	70
Figure 7. ACP100 Plant Depiction and Reactor Overview	76
Figure 8. DHR-400 Plant Depiction and Reactor Overview	81
Figure 9. HAPPY-200 Plant Depiction and Reactor Overview	86
Figure 10. HTR-PM 200 Plant Depiction and Reactor Overview	91
Figure 11. NUWARD Plant Depiction and Reactor Overview	97
Figure 12. SVBR-100 Plant Depiction and Reactor Overview	103
Figure 13. RITM-200N Plant Depiction and Reactor Overview	109
Figure 14. BREST-OD-300 Plant Depiction and Reactor Overview	116
Figure 15. Pilot Demonstration Power Complex Based on BREST-OD-300	121
Figure 16. SMART Plant Depiction and Reactor Overview	124
Figure 17. Rolls-Royce SMR Plant Depiction and Reactor Overview	129
Figure 18. BANR Plant Depiction and Reactor Overview	136
Figure 19. BWRX-300 Plant Depiction and Reactor Overview	143
Figure 20. SMR-160 Plant Depiction and Reactor Overview	149
Figure 21. KP-FHR Plant Depiction and Reactor Overview	158
Figure 22. PWR-20 Plant Depiction and Reactor Overview	165
Figure 23. VOYGR Plant Depiction and Reactor Overview	171
Figure 24. Aurora Plant Depiction and Reactor Overview	178
Figure 25. Sodium Plant Depiction and Reactor Overview	186
Figure 26. MMR Plant Depiction and Reactor Overview	192
Figure 27. Xe-100 Plant Depiction and Reactor Overview	200
Figure 28. CMSR Power Barge Plant Depiction and Reactor Overview	207
Figure 29. DF300 Plant Depiction and Reactor Overview	208
Figure 30. SHELF-M Plant Depiction and Reactor Overview	209
Figure 31. SEALER-55 Plant Depiction and Reactor Overview	210
Figure 32. FLEX Plant Depiction and Reactor Overview	211
Figure 33. Mini/Small LFR Plant Depiction and Reactor Overview	212
Figure 34. EM ² Plant Depiction and Reactor Overview	213
Figure 35. FMR Plant Depiction and Reactor Overview	214
Figure 36. Holos Quad Plant Depiction and Reactor Overview	215
Figure 37. FMR Plant Depiction and Reactor Overview	216
Figure 38. MCFR Plant Depiction and Reactor Overview	217
Figure 39. AP300 Plant Depiction and Reactor Overview	218
Figure 40. eVinci Plant Depiction and Reactor Overview	219
Figure 41. Xe-Mobile Plant Depiction and Reactor Overview	220
Figure 42. Electricity as Share of Total Energy Consumption, 2000-2050	252
Figure 43. Electricity Generation by Fuel & Scenario, 2000-2050	253
Figure 44. Map of Countries with Identified SAMR Project Prospects	273
Figure 45. SAMR Reactor Unit Forecast Scenarios, 2020-2050	276
Figure 46. SAMR Nuclear Capacity Forecast Scenarios, 2020-2050	276
Figure 47. SAMR Base Case Forecast by Region, 2020-2050	278
Figure 48. SAMR High Case Forecast by Region, 2020-2050	280
Figure 49. SAMR Low Case Forecast by Region, 2020-2050	281
Figure 50. SAMR Share of Global Nuclear Capacity by Scenario, 2020-2050	282
Figure 51. Base Case SAMR vs. Conventional Nuclear Capacity, 2020-2050	283
Figure 52. High Case SAMR vs. Conventional Nuclear Capacity, 2020-2050	283
Figure 53. Low Case SAMR vs. Conventional Nuclear Capacity, 2020-2050	284
Figure 54. SAMR Development Cost Expenditures, 2020-2050	285

Figure 55. SAMR Construction Cost Expenditures, 2020-2050	286
Figure 56. SAMR Operating Cost Expenditures, 2020-2050	287
Figure 57. SAMR Total Market Size Estimates, 2020-2050	288
Figure 58. SAMR Base Market Size by Expenditure Category, 2020-2050.....	289
Figure 59. SAMR Total Market Size Estimates in Real Dollars, 2020-2050	290
Figure 60. Map of UxC Nuclear Regions	304

List of Tables

Table 1. Leading SAMR Design Profiles	43
Table 2. CAREM-25 Main Technical Data	46
Table 3. CAREM-25 Strengths and Weaknesses.....	49
Table 4. ARC-100 Main Technical Data	51
Table 5. ARC-100 Strengths and Weaknesses	55
Table 6. SSR-W Main Technical Data	58
Table 7. SSR-W Strengths and Weaknesses.....	62
Table 8. IMSR Main Technical Data	64
Table 9. IMSR Strengths and Weaknesses.....	68
Table 10. ACPR50S Main Technical Data.....	71
Table 11. ACPR50S Strengths and Weaknesses.....	75
Table 12. ACP100 Main Technical Data.....	77
Table 13. ACP100 Strengths and Weaknesses.....	80
Table 14. DHR-400 Main Technical Data	82
Table 15. DHR-400 Strengths and Weaknesses	85
Table 16. HAPPY200 Main Technical Data.....	87
Table 17. HAPPY200 Strengths and Weaknesses.....	90
Table 18. HTR-PM 200 Main Technical Data	92
Table 19. HTR-PM 200 Strengths and Weaknesses	96
Table 20. NUWARD Main Technical Data	98
Table 21. NUWARD Strengths and Weaknesses.....	102
Table 22. SVBR-100 Main Technical Data	104
Table 23. SVBR-100 Strengths and Weaknesses	108
Table 24. RITM-200N Main Technical Data	110
Table 25. RITM-200N Strengths and Weaknesses	115
Table 26. BREST-OD-300 Main Technical Data	117
Table 27. BREST-OD-300 Strengths and Weaknesses	122
Table 28. SMART Main Technical Data	125
Table 29. SMART Strengths and Weaknesses	128
Table 30. Rolls-Royce SMR Main Technical Data.....	130
Table 31. Rolls-Royce SMR Strengths and Weaknesses.....	134
Table 32. BANR Main Technical Data	137
Table 33. BANR Strengths and Weaknesses.....	141
Table 34. BWRX-300 Main Technical Data	144
Table 35. BWRX-300 Strengths and Weaknesses	148
Table 36. SMR-160 Main Technical Data.....	150
Table 37. SMR-160 Strengths and Weaknesses.....	157
Table 38. KP-FHR Main Technical Data.....	159
Table 39. KP-FHR Strengths and Weaknesses.....	164
Table 40. PWR-20 Main Technical Data	166
Table 41. PWR-20 Strengths and Weaknesses	169
Table 42. VOYGR Main Technical Data	172
Table 43. VOYGR Strengths and Weaknesses.....	176
Table 44. Aurora Main Technical Data	179
Table 45. Aurora Strengths and Weaknesses	184
Table 46. Natrium Main Technical Data	187

Table 47. Sodium Strengths and Weaknesses.....	191
Table 48. MMR Main Technical Data.....	193
Table 49. MMR Strengths and Weaknesses.....	198
Table 50. Xe-100 Main Technical Data.....	201
Table 51. Xe-100 Strengths and Weaknesses.....	204
Table 52. Additional SAMR Design Profiles.....	206
Table 53. Additional SAMR Designs.....	221
Table 54. SAMR Projects by Status.....	242
Table 55. SAMR Projects by Country.....	243
Table 56. SAMR Projects by Vendor.....	244
Table 57. Global SAMR Project List.....	245
Table 58. SAMR Project Countries by Region.....	273
Table 59. Known Funding Commitments by SAMR Vendor.....	274
Table 60. UxC Base, High, and Low Case SAMR Unit and Capacity Forecasts, 2023-2040 & 2050.....	277
Table 61. SAMR Base Case Forecast by Region, 2025-2040 & 2050.....	278
Table 62. SAMR Base Case Forecast Details by Country, 2030-2050.....	279
Table 63. SAMR High Case Forecast by Region, 2025-2040 & 2050.....	280
Table 64. SAMR Low Case Forecast by Region, 2025-2040 & 2050.....	281
Table 65. SAMR Development Expenditures by Scenario, 2023-2040 & 2050.....	285
Table 66. SAMR Construction Cost Expenditures by Scenario, 2023-2040 & 2050.....	286
Table 67. SAMR Operating Cost Expenditures by Scenario, 2023-2040 & 2050.....	287
Table 68. SAMR Total Market Size by Scenario, 2023-2040 & 2050.....	288
Table 69. SAMR Base Market Size by Expenditure Category, 2023-2040 & 2050.....	289
Table 70. List of UxC Nuclear Countries by Region.....	304
Table 71. Complete SAMR Design List.....	309
Table 72. SAMR Vendor/Design Websites.....	313

Introduction and Overview

UxC, LLC, the world's leading nuclear market research and analysis firm, is pleased to present its new Small, Advanced, and Micro Reactor Assessments (SAMRA) special report, which is UxC's latest in-depth reactor market project. As the nuclear industry enters an exciting growth phase propelled by the global energy transition, small, advanced, and micro reactors (SAMRs) are at the forefront of shaping this new chapter for the nuclear industry. At the same time, this is still a nascent market sector, and thus requires detailed examination to assess the true state and prospects of the multitude of SAMR technologies and projects being proposed around the world. The SAMRA report is an unparalleled deep dive into this burgeoning market that delivers a unique and comprehensive evaluation of the global SAMR market, providing hard-hitting, fact-based analysis of the industry's current status plus insightful projections for the future of SAMRs. There is truly no other report like this in the market today.

This report covers the myriad new SAMR technologies under development today. For the purposes of this report, SAMRs are defined as follows:

- Small Reactors are designs supplying ~30 MWe up to ~500 MWe, which includes Small Modular Reactors (SMRs) that are based purely on evolutionary light water technologies (LWRs).
- Advanced Reactors are designs not based on traditional light water or heavy water technologies (i.e., not LWRs or HWRs).
- Micro Reactors are those of any technology type but only supply ~1 MWe up to ~30 MWe.

The drivers behind each of these reactor technologies vary, but there is an overwhelming sense of enthusiasm and mission helping to advance the industry's plans to design, build, and eventually operate a new fleet of nuclear power plants based on all sorts of SAMR technologies. It is with this backdrop in mind that UxC has prepared its new SAMRA report with the overarching aim of improving the world's knowledge and understanding of the SAMR marketplace to support the long-term viability of not only SAMRs but also the nuclear industry writ large.

UxC SAMR Credentials

UxC prides itself in providing unbiased and independent market analysis and forecasts for the nuclear industry. While we are perhaps best known for our work in the fuel cycle markets, UxC has been actively tracking and analyzing the commercial nuclear reactor markets for decades. Along the way, our team of in-house market analysts have been collaborating with international technical experts from industry and academia, who are authorities in reactor technology and design. While this new SAMRA report is the culmination of a year-long effort to research and analyze all the latest aspects of today's SAMR marketplace, UxC has been at the forefront of SAMR

market analysis for many years. In fact, our first foray into what began as the “SMR market” dates all the way back to 2009. Along the way, we have published several groundbreaking reports and other regular coverage on the SMAR market, including:

- 2010: Small Modular Reactor Assessments (SMRA) special report
- 2011: Nuclear Power in the Post-Fukushima Era special report
- 2012: SMR Research Center website
- 2013: SMR Market Outlook (SMO) special report
- 2018: SMR/AR analysis chapter in Nuclear Industry Value Chain (NIVC) report
- 2010-2023: Various essays and special analyses on SAMRs presented in Nuclear Power Outlook (NPO) quarterly reports
- 2010-2023: Continuous coverage and articles on SAMRs issued in Ux Weekly and UxC Headline News services

Information on all the above products and services can be found at www.uxc.com.

In addition to numerous reports and ongoing coverage of SAMRs, UxC experts have participated and presented at many SAMR-related industry events and conferences over the past decade plus. Moreover, UxC experts have been interviewed by several leading media and news outlets related to SAMRs over the years.

Purpose of Report

UxC anticipates that there are many likely uses of this SAMRA report as it is written with numerous purposes in mind. For starters, this report aims to find answers to the following key questions:

- What are all the potential market opportunities for advanced nuclear power in today’s and tomorrow’s energy markets?
- What are the challenges to future expansion of SAMR-based nuclear power?
- How do the currently proposed SAMR designs stack up against each other?
- What factors will lead to different SAMRs being deployed in various markets around the world?
- What does the forecast range look like for SAMR designs from now until 2050, and what kind of market size does this equate to?

The SAMRA report is the only publicly available study that includes independent comparative analyses of the world’s SAMR designs. Additionally, this report presents constructive analyses and ideas for the future of this evolving and exciting new reactor sector. Among the target audiences, are the following:

- Existing and prospective SAMR vendors can compare their strengths and weaknesses with those of direct competitors.
- Utilities and other potential end-user customers can evaluate how various SAMR designs stack up against each other and fit their specific energy supply needs.
- Government agencies, regulatory bodies, international institutions, and research organizations will become more educated on the evolving SAMR market.
- Investors will gain unique insights into the SAMR nuclear energy market sector and the prospects for individual reactor suppliers.
- Nuclear supply chain companies and fuel cycle suppliers can evaluate the potential opportunities to participate in future SAMR projects.

Ultimately, no matter what your position, whether you are an active stakeholder or just interested observer in the nuclear industry, now is clearly the time to assess the current state and future prospects for the SAMR market. This report offers the kind of full scope review with hard-hitting analysis of this rapidly evolving market in a way that cannot be found anywhere else in the world today.

Structure of Report

The SAMRA is very extensive report with over 320 pages of detailed data and information on the SAMR market. In addition to this **Introduction and Overview**, the report includes the following chapters:

Chapter 1 – SAMR Market Overview sets the stage for the follow-on market analysis by providing key definitions for SAMRs, explaining the main reasons why these designs are now at the top of the nuclear industry’s minds, and briefly reviewing the current state of SAMRs in key countries around the world.

Chapter 2 – Profiles of Leading SAMR Designs presents detailed profiles of the 25 leading SAMR technologies in the world today. Each profile includes an overview and history of the vendor and design, highlights of the technology itself, target markets and applications, economics and cost targets, various factors affecting its current and future deployment prospects (e.g., financing, licensing, supply chain, etc.), and fuel cycle considerations. To provide a clear vision of these leading SAMR designs’ future prospects, each profile concludes with a comparison of the design’s strengths and weaknesses as it relates to future commercialization and deployment potential.

In **Chapter 3 – Additional SAMR Designs**, we present additional shorter profiles of another 16 SAMR designs that are in advanced stages of development. The chapter also includes a longer list of all the other SAMR technologies that have been proposed around the world that are known to us currently. In total, the report covers nearly 150 different SAMR designs.

To assess not only the technologies, but also the state of SAMR deployment projects, **Chapter 4 – Active and Proposed SAMR Projects** provides a lengthy discussion of all the various SAMR projects in upwards of 40 countries understood to be pursued in the world today. These projects are presented in the following categories: operating, under construction, in advanced planning, planned, and prospective.

Chapter 5 – SAMR Market Analysis includes a number of different evaluations of the state of the SAMR market today, such as the main factors supporting future expansion of SAMR-based nuclear power, the main challenges to future deployment, as well as a section entitled “Lessons from the SAMR Graveyard.”

In **Chapter 6 – SAMR Market Projections**, we present the results of UxC’s detailed SAMR reactor market forecast modeling. This includes three unique scenarios (High, Base, and Low) for future SAMR reactor counts and generating capacities (MWe) for the period through 2050. The second set of projections relates to how these reactor forecasts translate into market size estimates broken down into development costs, construction costs, and operating costs.

Chapter 7 – Summary and Conclusions summarizes all the key data from this extensive report and concludes with our final analysis of the SAMR market, including a discussion of the clear leaders and up-and-comers in the market today.

Lastly, the report includes several additional data sets and information in the Appendices as follows:

Lastly, the report includes several additional data sets and information in the Appendices as follows:

Appendix A – UxC Nuclear Market Regions

Appendix B – Review of U.S. Government SAMR Programs

Appendix C – SAMR Design List

Appendix D – SAMR Vendor/Design Websites

Appendix E – SAMR Related Reports and Other Resources

Glossary