UXC Special Report
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Small, Advanced, and Micro Reactor Assessments

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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:

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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

