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China's Nuclear Reactor and Fuel Cycle Markets

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Table of Contents

List of Figures

List of Tables

Introduction and Overview

The Ux Consulting Company (UxC) is pleased to present this special report on **China's Nuclear Reactor and Fuel Cycle Markets**, which provides a comprehensive perspective on all the key aspects of China's nuclear power and fuel cycle industries and initiatives as of the end of 2016.

Purpose of Report

No country in the world today is more consequential for the nuclear markets than China. UxC continuously monitors and updates its research and analysis of China's nuclear program in all areas, including the front-end nuclear markets and the domestic and reactor export programs. In order to enhance its deep understanding of this critical country, UxC also works with leading experts on China's nuclear program, including Dr. Hui Zhang of Harvard University's Belfer Center for Science and International Affairs. Through these efforts, UxC has prepared this new 2016 special report to present the latest information and analysis of all critical aspects of China's nuclear industry.

This new report provides in-depth coverage and forecasts for China's nuclear power and reactor exports as well as the individual front-end fuel cycle component markets of uranium, conversion, enrichment, and fabrication, and also an overview of the back-end fuel cycle program. Additional insights and discussions on the current role and potential future direction of China's nuclear program are also included.

Over the past five years since Fukushima, there have been many changes and new developments that have affected China's approach to nuclear power. This report provides factual data and holistic analysis on all key aspects of the country's nuclear program, including the current drivers and potential future direction of China's nuclear industry.

It should be understood that much of this report is a compilation of materials that UxC has presented in its various standard publications, although major efforts have been made to enhance each section through additional information, and analysis. Moreover, all sections of this report include material updated as of December 2016, including UxC's own analysis as well as information obtained through research of various open sources covering nuclear energy developments in China.

Key Questions on China's Nuclear Markets

The following list presents some of the major questions and concerns surrounding China's nuclear power and fuel cycle programs:

- How fast can China's nuclear power fleet grow?
- What reactor technologies will China look to build in the future?
- How many reactors will China have operating in 2020, 2030, and 2040?
- Where will Chinese companies build reactors outside of the country?
- How much of its uranium needs will China be able to satisfy through domestic and foreign mine projects?
- How quickly can China ramp-up its UF_6 conversion capabilities?
- What are China's intentions in terms of enrichment capacity expansions and SWU exports?
- What types of fuel assemblies will China manufacture in the future?
- How will China manage its spent nuclear fuel and radioactive waste?

This report attempts to respond to these and other questions while providing a comprehensive review and assessment of China's current nuclear program and its prospects.

Structure of Report

In addition to this **Introduction and Overview**, this detailed report includes separate chapters of the different aspects of China's nuclear program as follows:

Chapter 1 – China's Nuclear Power Policy and Regulations presents the current state of nuclear power and related government policy in China, including official targets for future growth. This chapter also covers key issues, including electricity market reforms, the government agencies involved in creating nuclear policy, as well as China's approach to nuclear safety regulations.

Chapter 2 – China's Domestic Nuclear Power Program provides a detailed description of the three major nuclear power companies in China and their many reactor projects, including nuclear plants in operation, under construction, and in planning. This chapter also presents UxC's proprietary nuclear power forecasts for China through 2040.

Chapter 3 – China's Reactor Technologies and Supply Chain gives an overview of all the main nuclear reactor technologies and their developments in China. Additionally, a discussion of China's domestic reactor supply chain and efforts to localize technology from overseas suppliers is also included.

Chapter 4 – China's Reactor Export Ambitions reviews and analyzes China's recent push to export its nuclear power plant technologies and to become more involved in international nuclear projects around the globe.

Chapter 5 – China's Uranium Industry shifts to the first part of China's nuclear fuel cycle program. This chapter takes a detailed look at all of China's efforts to secure natural uranium (U_3O_8) from domestic and international sources to ensure stable nuclear fuel supplies for the long-term.

Chapter 6 – China's Conversion Industry takes a detailed look at China's evolving uranium conversion industry and examines prospects for future expansion.

Chapter 7 – China's Enrichment Industry reviews all the details surrounding China's uranium enrichment industry with a special focus on its gas centrifuge development program and recent efforts to become a global supplier of SWU.

Chapter 8 – China's Fuel Fabrication Industry reviews the current state of China's nuclear fuel fabrication industry and its efforts to develop its own indigenous fuel designs.

Chapter 9 – China's Back-End Nuclear Fuel Cycle Program provides an overview of the state of spent fuel and radioactive waste management in China.

Chapter 10 – Conclusions and Final Analysis presents UxC's final analysis of the current state of China's nuclear market and the outlook for future developments in both the reactor and fuel cycle sectors.

Additional research and informational items related to China's nuclear program and industry are found in the following **Appendices** at the end of the report:

Appendix A – UxC Interview with Dr. Hui Zhang, Harvard University

Appendix B – Dr. Hui Zhang Presentation to UxC 2016 Seminar

