

# Foreword and Acknowledgments

For well over a century, electricity has made vital contributions to the growth of the U.S. economy and the quality of American life. The U.S. electric grid is a remarkable achievement, linking electric generation units reliably and efficiently to millions of residential, commercial, and industrial users of electricity through more than six million miles of lines and associated equipment that are designed and managed by more than 3,000 organizations, many of which are in turn regulated by both federal and state agencies. While this remarkable system of systems will continue to serve us well, it will face serious challenges in the next two decades that will demand the intelligent use of new technologies and the adoption of more appropriate regulatory policies.

This report aims to provide a comprehensive, objective portrait of the U.S. electric grid and the challenges and opportunities it is likely to face over the next two decades. It also highlights a number of areas in which policy changes, focused research and demonstration, and the collection and sharing of important data can facilitate meeting the challenges and seizing the opportunities that the grid will face.

This study is the sixth in the MIT Energy Initiative's "*Future of*" series. Its predecessors have shed light on a range of complex and important issues involving energy and the environment. While the previous studies have focused on particular technologies and energy supply, our study of the grid necessarily considers many technologies and multiple overlapping physical and regulatory systems. Because of this breadth, our efforts were focused on integrating and evaluating existing knowledge rather than performing original research and analysis. In addition, this study's

predecessors focused on implications of national policies limiting carbon emissions, while we do not make assumptions regarding future carbon policy initiatives. Instead, we mainly consider the implications of a set of ongoing trends and existing policies.

We anticipate this report will be of value to a wide range of decision makers in industry and government as they guide the grid's continuing evolution. We have attempted to provide thorough discussions of key topics to serve as references, to support our findings and recommendations, and to meet the needs of what we expect will be a diverse audience in terms of interest and expertise. Also, for those less familiar with the industry, we include appendices on the grid's history and technology. Chapter 1 provides an overview of the status of the grid, the challenges and opportunities it will face, and our major recommendations. To facilitate selective reading, detailed descriptions of the contents of each section in Chapters 2–9 are provided in each chapter's introduction, and recommendations are collected and briefly discussed in each chapter's final section.

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The final report represents the opinions of the study group, which is solely responsible for its content. The advisory committee and sponsors are not responsible for, and do not necessarily endorse, the findings and recommendations contained within this report.