# Building a Sustainable Energy Future:

U.S. Actions for an Effective Energy Economy Transformation





# Building a Sustainable Energy Future: U.S. Actions for an Effective Energy Economy Transformation



### **National Science Board Members**

**Steven C. Beering**, *Chairman*, President Emeritus, Purdue University, West Lafayette, Indiana **Patricia D. Galloway**, *Vice Chairman*, Chief Executive Officer, Pegasus Global Holdings, Inc., Cle Elum, Washington

Mark R. Abbott, Dean and Professor, College of Oceanic and Atmospheric Sciences Oregon State University, Corvallis
Dan E. Arvizu, Director and Chief Executive, National Renewable Energy Laboratory (NREL), Golden, Colorado
Barry C. Barish,\* Director, Global Design Effort for International Linear Collider, Linde Professor of Physics,
Emeritus, California Institute of Technology, Pasadena

**Camilla P. Benbow**, Patricia and Rodes Hart Dean of Education and Human Development, Peabody College of Education and Human Development, Vanderbilt University, Nashville, Tennessee

Ray M. Bowen, President Emeritus, Texas A&M University, College Station

John T. Bruer, President, The James S. McDonnell Foundation, Saint Louis, Missouri

G. Wayne Clough, Secretary, Smithsonian Institution, Washington, DC

France A. Córdova, President, Purdue University, West Lafayette, Indiana

**Kelvin K. Droegemeier**, Associate Vice President for Research, Regents' Professor of Meteorology and Weathernews Chair, University of Oklahoma, Norman

**José-Marie Griffiths**, Dean and Professor, School of Information and Library Science, Director of Biomedical Informatics, TraCS Institute, School of Medicine, University of North Carolina, Chapel Hill

Esin Gulari, Dean of Engineering and Science, Clemson University, Clemson, South Carolina

Elizabeth Hoffman,\* Executive Vice President and Provost, Iowa State University, Ames

**Louis J. Lanzerotti**, Distinguished Research Professor of Physics, Center for Solar Terrestrial Research, Department of Physics, New Jersey Institute of Technology, Newark

**Alan I. Leshner**, Chief Executive Officer, Executive Publisher, *Science*, American Association for the Advancement of Science, Washington, DC

G.P. "Bud" Peterson, President, Georgia Institute of Technology, Atlanta

Douglas D. Randall, Professor and Thomas Jefferson Fellow, University of Missouri, Columbia

Arthur K. Reilly, Senior Director, Strategic Technology Policy, Cisco Systems, Inc., Ocean, New Jersey

Diane L. Souvaine, Professor and Chair, Department of Computer Science, Tufts University, Medford, Massachusetts

Jon C. Strauss, Interim Dean, Edward E. Whitacre Jr. College of Engineering, Texas Tech University, Lubbock

**Kathryn D. Sullivan**, Director, Battelle Center for Mathematics and Science Education Policy, John Glenn School of Public Affairs, Ohio State University, Columbus

**Thomas N. Taylor**, Roy A. Roberts Distinguished Professor, Department of Ecology and Evolutionary Biology, Curator of Paleobotany in the Natural History Museum and Biodiversity Research Center, The University of Kansas, Lawrence

**Richard F. Thompson**, Keck Professor of Psychology and Biological Sciences, University of Southern California, Los Angeles

#### Member ex officio:

Arden L. Bement, Jr., Director, National Science Foundation, Arlington, Virginia

**Craig R. Robinson**, Acting Executive Officer, National Science Board and National Science Board Office Director, Arlington, Virginia

#### Task Force on Sustainable Energy, Committee on Programs and Plans

Dan E. Arvizu, Co-ChairmanJohn T. BruerArthur K. ReillyJon C. Strauss, Co-ChairmanJosé-Marie GriffithsSteven C. Beering, ex officioMark R. AbbottElizabeth Hoffman\*Patricia D. Galloway, ex officioCamilla P. BenbowDouglas D. RandallArden L. Bement, Jr., ex officio

Tami Tamashiro, Executive Secretary

\_

<sup>\*</sup> Board Consultant

## **Contents**

Contents	
Memorandum	V
Acknowledgments	vi
Executive Summary	1
Introduction	3
Key Findings	6
Recommendations to the U.S. Government	9
Guidance for the National Science Foundation	14
Conclusion	16
Endnotes	17
Appendix A: History and Context of Sustainable Energy	21
Appendix B: Charge to the Task Force on Sustainable Energy	43
Appendix C: Roundtable Discussion 1—February 8, 2008	47
Appendix D: Roundtable Discussion 2—June 19, 2008	51
Appendix E: Roundtable Discussion 3—September 4, 2008	55
Bibliography and Other Related Sources	59

