Energy for Keeps

Creating Clean Electricity from Renewable Resources

Marilyn Nemzer
Deborah Page
Anna Carter

Ingeniously Illustrated

EXPANDED 3RD EDITION

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Illustrated by
Will Suckow

Energy Education Group
Tiburon, California

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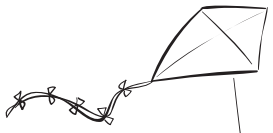
TABLE OF CONTENTS



ABOUT THIS PUBLICATION

Energy for Keeps offers an introduction to renewable energy for everyone who uses electricity — from students to energy policy makers. This book helps readers of all ages understand the energy issues that loom large in our daily news.

With clear language and engaging illustrations, *Energy for Keeps* covers all renewable energy sources, the science of electricity generation, energy history, environmental considerations, and energy management and efficiency.

Energy for Keeps explains both renewable and nonrenewable energy resources, with an emphasis on renewables. It does not promote a particular technology. To ensure the book's accuracy, the authors interviewed — and had drafts reviewed by — experts from utilities, universities, state and federal agencies, national laboratories, power suppliers and industry. (See Acknowledgments, page iv.)

Aimed at furthering energy literacy for the general public, *Energy for Keeps* also serves as a great text for students of many ages. On the *Energy for Keeps* website, educators will find student activities and other supplementary information that may be downloaded free.

Earlier editions of *Energy for Keeps* received the Interstate Renewable Energy Council's 2004 Innovation Award and a 2006 Green Power Leadership Award from the U.S. Environmental Protection Agency, the U.S. Department of Energy, and the Center for Resource Solutions.

Utilities, government agencies, energy companies, and other entities may want to provide *Energy for Keeps* to their non–technical staff, or to public libraries or schools. For details please contact the Energy Education Group, **www.energyforkeeps.org**.

THE ENERGY EDUCATION GROUP

The Energy Education Group is a division of The California Study, Inc., a nonprofit 501(c)(3) organization based in Tiburon, California. Its expertise is in renewable energy education with a focus on power generation. Its goal is to help people understand where our electricity comes from and how energy choices affect our lives, our environment, and future generations.

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Marilyn Levin Nemzer, Editor
May 2010

BENJAMIN FRANKLIN: AN INSPIRATIONAL FIGURE

Benjamin Franklin hosts the pages of *Energy for Keeps*. We chose him not only for his contributions to the field of electricity, but also because he always sought, through hard work and ingenuity, to understand the world around him and to make a positive impact on it.

BENJAMIN FRANKLIN: 1706 – 1790

The best-known story about Ben Franklin is that he experimented with electricity by flying a kite in a raging lightning storm. In reality he did not stand out in a storm (a soaking wet string could have made this experiment fatal), nor was he trying to have lightning actually strike his kite.

Ben had been studying electricity. He had correctly proposed that the sparks resulting from what we now call static electricity — an object of great fascination at that time — were due to excess electrical charges building up in an object and then leaping, or discharging, to an object of lesser charge. He speculated that thunderclouds, too, could build up excess electrical charges and that lightning was the discharge from the cloud to the ground (or other object such as a tree or house). He thought he could prove this theory by flying a kite just before a storm began (before the thunder, lightning and rain started), hoping to draw "fire" (electrical charge) out of the clouds.

So, one day in June of 1752, when a storm was brewing, he tested his idea. He placed a metal wire on a kite's upper tip and tied a metal key to the bottom of the kite string. Standing in a shed as protection from the potential downpour, he flew his kite up into the dark clouds. When the fibers on his kite string began standing up, he gently touched the key and must have been pleased to feel an electrical charge. His experiment confirmed that thunderclouds generate static electricity. He also correctly concluded that lightning results from the build-up and discharge of excess electrical charges.

(continued)

BENJAMIN FRANKLIN (continued)

Ben was not just an avidly curious scientist, but also a writer, a publisher, an inventor, a civic leader, and a statesman. He had his own print shop where he wrote and produced a newspaper and an annual almanac, among other publications. His many inventions include the lightning rod, bifocal glasses, the Franklin stove (a free-standing fireplace), and the odometer (which measures mileage). He began the nation's first lending library and the first fire department. He was Postmaster General of the American colonies. He contributed significantly to the writing of the Declaration of Independence and worked for the abolition of slavery. To top it off, his close diplomatic and scientific ties with Europe influenced France to support the colonial Americans during the Revolutionary War.

For his contributions to science and society, we are pleased to honor Ben Franklin as the host of *Energy for Keeps*.

NEVER A DULL MOMENT

Life with Ben must have been pretty interesting. Imagine living with him while he was testing his new invention, the lightning rod. A metal rod on the roof attracted lightning, which traveled safely to the ground through a wire, sparing the house from fire. In one experiment, he threaded the wire right through the inside of his own house along the staircase banister. One stormy night the family awoke to the sound of bells clanging wildly. It turned out that Ben had attached metal bells to the wire along the banister, so that he would be alerted when electricity passed through to the ground.

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