



CREATING A BRIGHT ENERGY FUTURE

GCEP at 10 Years

Global Climate & Energy Project
STANFORD UNIVERSITY

The Global Climate and Energy Project (GCEP) has reached an important milestone, our 10th anniversary. On November 20, 2002, Stanford University President John Hennessy and Professor Franklin M. Orr, Jr., announced the formation of GCEP, a unique partnership between four of the world's leading corporations and Stanford. Motivated by the need to provide affordable and secure energy with low greenhouse gas emissions to the world's growing population, GCEP's founding sponsors — ExxonMobil, GE, Schlumberger and Toyota — joined together to support fundamental science and engineering research to underpin a new generation of energy technologies. In 2011, DuPont joined the GCEP partnership, bringing new perspectives and insights about the global energy challenge.

At GCEP, our strategy is to take a long view by supporting game-changing research with a 10- to

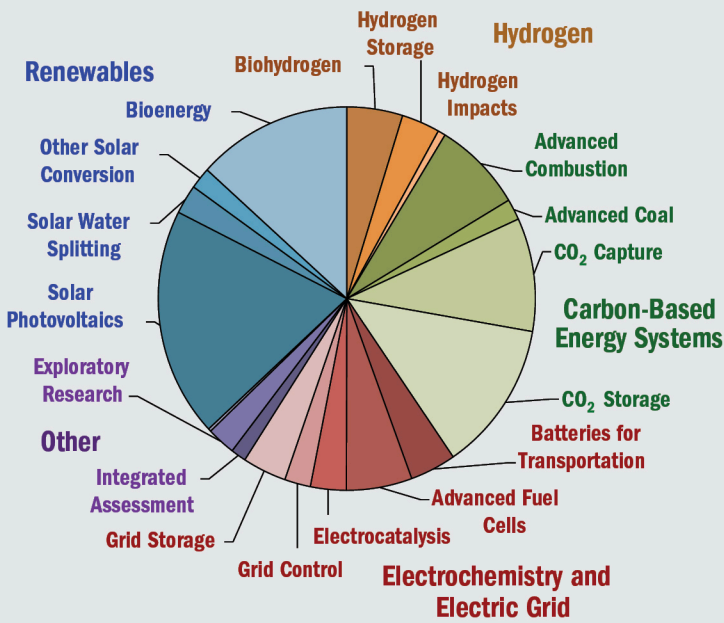


50-year time horizon. Combining the know-how of our sponsors with the expertise at Stanford and other academic institutions has allowed us to identify many exciting new avenues of research, while educating the next generation of energy thought leaders. To date,

GCEP has provided more than 600 graduate students and postdoctoral researchers the opportunity to focus on energy during a very creative time in their lives. Today, GCEP is widely recognized as an engine for innovation throughout the global energy sector. Our goal is to keep that innovation pipeline filled with new ideas and new approaches that will ultimately make efficient, environmentally sustainable, low-cost energy available to everyone.

Sally M. Benson

Director, Global Climate and Energy Project
Stanford University



ASSESSING ENERGY SYSTEMS

GCEP conducts analysis of global energy systems to better understand the significance and impact of energy technologies on people and the planet. Major efforts include a full analysis of the Earth's energy resources and the human energy system, energy storage options and the the potential worldwide impact of bioenergy, as well as a net energy analysis of photovoltaics.



BUILDING A RESEARCH PORTFOLIO

GCEP has built a diverse research portfolio of innovative technologies in areas such as solar power, biomass energy, advanced combustion, carbon capture and sequestration, transportation and the electrical grid. We have supported 80 scientific programs led by 165 faculty members at 39 research institutions across the globe. GCEP researchers have published more than 500 papers in leading journals and given more than 700 presentations at conferences. Countless conversations with scientists and engineers in the research organizations of our corporate partners have also enriched and sharpened the focus of our research.





RESEARCH HIGHLIGHTS

GCEP-supported research has led to significant advances in a wide range of cutting-edge energy technologies, including:

- Improved light management techniques and nanoscale designs for increasing the efficiency of photovoltaic systems.
- Advanced combustion for radically improving efficiency through optimized engine design.
- Magnetic resonance coupling for wirelessly charged electric vehicles.
- New lignin management approaches to increase biofuel conversion efficiency from energy crops.
- Novel microbial bioreactors that use renewable energy to produce methane and other fuels.
- Increasing confidence in geological storage of carbon dioxide by improved monitoring approaches, optimization of injection schemes and new fundamental insights on what controls CO₂ movement in the subsurface.

CREATING AN ENERGY COMMUNITY

Over the last decade, GCEP has built a strong international community of energy experts from academia and industry. Each year, GCEP hosts a major research symposium that gives scholars, industry leaders and policymakers an opportunity to present recent results and discuss current topics

in energy. The symposium features the popular Energy 101 tutorials, where top researchers explain the fundamentals about emerging technologies. Videos from the symposium are available on the GCEP website, along with summaries and detailed technical reports about GCEP-funded research. More than 7,500 people also receive the GCEP Quarterly e-newsletter updating our latest activities.

Since 2002, GCEP has hosted nearly 20 workshops on key energy issues, from carbon capture to advanced transportation. GCEP established a distinguished lecturer program, which allows researchers to engage in a dialogue with in-house R&D teams at sponsoring companies, and a student energy lecture series that provides a forum for GCEP graduate students and postdoctoral scholars.

INITIATING FOLLOW-ON RESEARCH

Many of the exciting discoveries developed at GCEP have blossomed into major research programs, including the Stanford Center for Carbon Storage and the federally funded Bay Area Photovoltaic Consortium (BAPVC), Center on Nanostructuring for Efficient Energy Conversion (CNEEC), Joint Center for Artificial Photosynthesis (JCAP) at Caltech and Center for Ultra-Wide-Area Resilient Electric Energy Transmission Networks (CURENT) at the University of Tennessee.



GROUNDBREAKING TECHNOLOGIES



"The goal of the Global Climate and Energy Project is to enable affordable, safe, secure and sustainable energy for everyone on the planet."

SALLY M. BENSON



Since 2002, GCEP has fostered a collaborative environment that encourages the development of new energy technologies. Our research programs have generated more than 30 patent applications and three Silicon Valley startup companies that are working to commercialize advanced battery, combustion and photovoltaic technologies. GCEP researchers have produced important technical advances with the potential of significantly impacting the energy landscape in coming decades. Using the scientific tools of theory, experimentation and simulation – combined with the ingenuity of our faculty, staff and students – GCEP has developed new approaches for improving solar cells, fuels from sunlight, biofuel feedstocks and long-lasting batteries with higher energy density. We have also explored new techniques for safely storing carbon dioxide underground, combusting fossil fuels more efficiently and even charging the battery of your electric car while you drive down the road.



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The Global Climate and Energy Project is a groundbreaking university-industry partnership that supports fundamental research on sustainable, efficient technologies that significantly reduce greenhouse gas emissions and are cost effective when deployed at scale. GCEP was established in 2002 with the support of corporate sponsors ExxonMobil, GE, Schlumberger and Toyota. DuPont became a sponsoring partner in 2011.



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