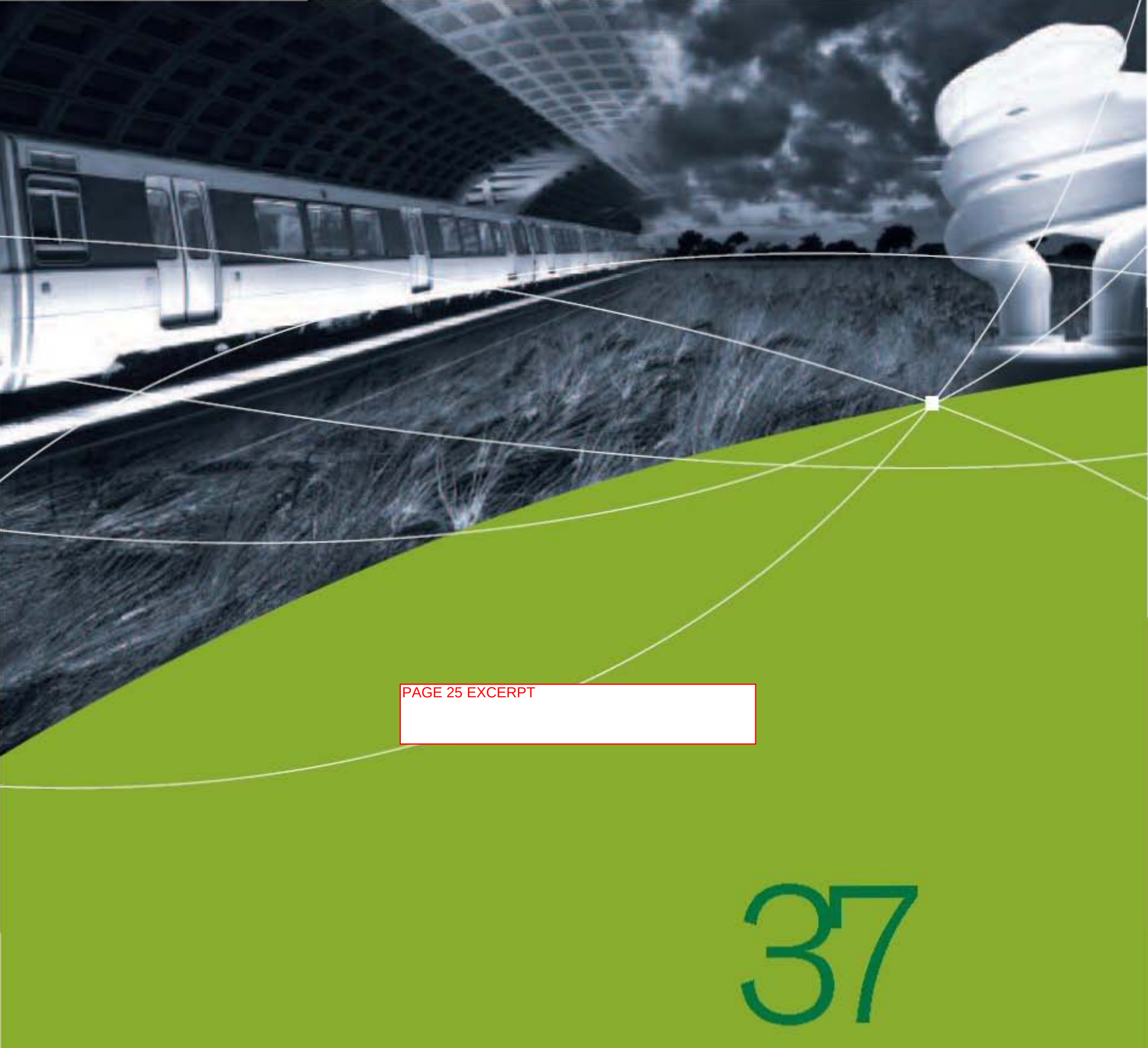

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AICGS POLICY REPORT

SHORT-TERM SOLUTIONS TO THE CLIMATE AND ENERGY CHALLENGE

Felix Chr. Matthes
Lewis J. Perelman

AMERICAN INSTITUTE FOR CONTEMPORARY GERMAN STUDIES THE JOHNS HOPKINS UNIVERSITY

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FOREWORD

This Policy Report is another significant study in the area of climate change and energy security, an important part of AICGS' research activities in 2008 and beyond. It was made possible through a generous grant from the *Daimler-Fonds im Stifterverband für die Deutsche Wissenschaft*.

In their studies, Lewis J. Perelman and Felix Chr. Matthes examine technological solutions that can make a substantial impact on climate protection and energy security today and in the near future. The crucial roles of energy efficiency, alternative energy production, and intelligent energy use are investigated for both Germany and the United States.

Avoiding climate change by developing and implementing new technologies is an attractive solution to the public and governments alike, as it is the least likely to fundamentally change our way of life. Yet, as Lewis Perelman outlines in his essay, technological developments take a considerable amount of time and cannot guarantee a satisfying solution. This is especially so as different agendas concerning energy security, economic policies, and environmental matters compete for the same financial resources. Thus, it is often most promising to design policies and measures to develop and implement technologies which combine all three competing agendas.

As Felix Matthes points out, in Germany, any improvement in the energy sector will require a basic restructuring of the infrastructure. For example, wind energy produced in northern Germany will have to be channeled to central Germany where the main energy users are located. Another area that has to be urgently addressed is energy storage, not least because of the proverbial "the wind does not always blow, the sun not always shine."

Both authors point out that any technological breakthroughs will have to be triggered by the right political, economic, and behavioral decisions. In the past, Germany has put its emphasis on regulating behavioral changes of the consumer. In the United States, the focus was rather on finding technological breakthroughs. Transatlantic collaboration in the area of research and development as well as a best-practice exchange regarding useful policies and measures could further the international debate on solutions for climate change immensely. There is no need to replicate the errors made elsewhere but in light of the short timeframe in which climate change has to be addressed, all the necessity to learn from each other.

AICGS will continue to foster the German-American dialogue on climate change and energy. We would like to thank the authors, the *Daimler-Fonds*, and Jessica Riester for her help in editing this publication.

Dr. Jackson Janes
Executive Director
AICGS

Alexander Ochs
Director of International Policy
CCAP

ABOUT THE AUTHORS

Dr. Felix Chr. Matthes is Senior Scientist at the Institute for Applied Ecology (Öko-Institut) in Germany, Coordinator of the Energy & Climate Division at the Institute for Applied Ecology, and a Guest Lecturer for energy policy analysis at Otto-Suhr-Institute for Political Science at the Free University of Berlin. From 2000 to 2002 he was a Scientific Member of the Study Commission (Enquete Commission) "Sustainable Energy in the Framework of Globalization and Liberalization" of the 14th German Bundestag. He then worked from 2002 to 2004 as Deputy Director of the Institute for Applied Ecology. In 2007 and 2008 Dr. Matthes was a Visiting Scientist at the Massachusetts Institute of Technology (Joint Program on the Science and Policy of Global Change). He is the author of numerous studies and publications on German and international energy, environmental, and climate policy. Key research topics during the last years have included CO_2 emissions trading, regulation of carbon dioxide capture and storage, energy and emissions projections, EU energy market development and market liberalization, assessment of policy tools in energy and environmental policies and international climate policy (e.g., national expert for in-depth review missions on national communications under the UNFCCC on behalf of the UNFCCC secretariat). Dr. Matthes received his PhD in political science summa cum laude at the Free University in Berlin in 1999.

Dr. Lewis J. Perelman is a member of the Institute of Electrical and Electronic Engineers, the Society for Risk Analysis, and is also a Senior Research Fellow of the Institute for Regulatory Science. He has over thirty years of professional experience focused on the processes of innovation, transformation, sustainability, and resilience; including strategic intelligence, policy development, planning, and assessment—as a consultant, analyst, author, publisher, and teacher. Dr. Perelman has taught at Harvard University and George Mason University, has appeared on numerous radio and television programs, and has lectured at conferences, seminars, and meetings of business, public, and nonprofit organizations throughout the world. Dr. Perelman's publications include 12 books and over 100 other publications. As an author, Dr. Perelman produced *School's Out*, a best-selling book based on Project Learning 2001, which he directed as a senior research fellow at the Hudson Institute. His first book, *The Global Mind*, was cited as one of the best scientific/technical books of the year by *The Library Journal*. Dr. Perelman was an editor and contributor to *Energy Transitions* for the American Association for the Advancement of Science, and authored *The Learning Enterprise* for the Council of State Planning Agencies. For over four years, he was Executive Editor of *Knowledge Inc.*, the leading management newsletter on organizational intelligence. He also served on the editorial board of the journal *Technology & Culture*. Dr. Perelman earned his doctorate in Administration, Planning, and Policy at Harvard following a special program of research applying cognitive science, human ecology, and welfare economics to strategies for sustainable development.

trical transmission, their current need for cryogenic cooling substantially limits their contribution to energy efficiency. Through over twenty years of research, the Holy Grail sought by scientists in this field is the discovery of a material that can be superconducting at much higher temperature, closer to normal ambient conditions. If and when such a breakthrough occurs, the impact on the electrical sector of our energy economy would be immense, even revolutionary.

LOW-ENERGY NUCLEAR REACTIONS

Probably the farthest-out of potential breakthrough opportunities I will mention here rests on the inchoate science of low-energy nuclear reactions (LENR)—phenomena misleadingly called "cold fusion" when they were first discovered two decades ago, with the untoward consequence that both their discoverers and the subject were soon not only discredited but assailed. (Whatever else, this history may stand as one of the more acute examples of the toxic effect of hype on potential technology development.)

Essentially, the LENR phenomena entail the observation that when current flows through electrodes composed of very particular types of materials immersed in water, surplus energy appears to be generated beyond what would be expected from chemical reactions alone. The first guess, which proved unfortunate, was that some kind of nuclear fusion was occurring at temperatures astronomically lower than seemed theoretically possible.

More recent research, notably by Lewis Larsen and Allan Widom, based on experiments that were continued over the subsequent decades, indicates that the phenomena are real but entirely different from the kind of atomic fusion reaction that occurs at immensely high temperatures inside the stars or in a hydrogen bomb. Or in the gigantic machines called tokomaks that a few research centers have been trying to develop for decades in the attempt to harness the fusion genie in a magnetic bottle.

According to the Larsen-Widom analysis, the tabletop, LENR reactions involve what's called the "weak nuclear force," and require no new physics.[22] Larsen anticipates that advances in nanotechnology will eventually permit the development of compact, battery-like LENR devices that could, for example, power a cell phone for five hundred hours.

Obviously, such an application would not offer any significant macroeconomic impact on the nation's energy budget. But as we now see lithium batteries migrating from just such small-scale applications to soon powering cars and trucks, it is imaginable that a breakthrough in LENR technology might eventually lead to products capable of making a substantial dent on energy use.

Section 4: The Ultimate Fix: Money

As suggested at the outset of this essay, despite the dazzling array of possible technical fixes to our energy, security, and climate concerns—a list that could be far longer than the one surveyed here—by far the most important and influential is also the most elemental. That is, money, and the diverse ways we create, acquire, use it, and also lose it.

While perhaps we are not accustomed to think of money as technology, it takes only slight reflection and historical recollection to realize that indeed money is a social invention that is over 4,000 years old. It also is one that has undergone continual mutation and evolution—from literally "hard" currency to paper proxies and now to digital symbols.

As touched on several times above, the dynamics of money and its use have a powerful effect on whether and how other innovations get developed, and whether and how particular innovations get adopted in popular use.

Real answers to the question of which technical fixes may affect America's energy, security, and climate interests in the near term, and how, inevitably depend on at least four key financial issues.

PRICE

In the wake of the oil crises of the 1970s, and the rapid escalation of the price of oil, there was a popular view among government, business, and the general public that "alternative," more secure sources of energy not only were needed but with a bit of government stimulus could soon be developed to compete economically with increasingly expensive petroleum. President Jimmy Carter proclaimed a bold plan aimed at energy "independence" that included the goal of