

Alternative Energy in Military Contexts: Training, Simulation and Educational Roles

Mark C. Davis
Wood Duck Research, Inc.
Mooreville, North Carolina
davismc@ieee.org

Jennifer H. Nolan, John J. Tran & Dan M. Davis
Catholic Polytechnic University
Pasadena, California
{jnolan, jtran & ddavis}@catholicpolytechnic.org

ABSTRACT

A major function of the simulation community is evaluation. The future holds many unknowns, not the least of which is the impact from sustainable energy adoption and from decreasing reliance on traditional sources. These influences may flow in both directions: the impact on energy policy from defense imperatives and the impact on defense from energy policies. Some of these issues generate emotional and political controversies that obfuscate rational approaches to optimal resolutions of competing interests. The I/ITSEC community has a special place in its long-term provision of objective representations of defense matters, driven by the constant pressure of knowing that lives are literally at stake in every decision. This paper lays out the issues based on both the study and the experience of the authors, as well as an extensive literature review of the range of opinions and options. This is followed by a survey of the plethora of simulation implementations and the range of constraints and opportunities represented therein, especially those that are energy dependent or energy threatened. These matters are then considered in view of the needs of both the "end users" warfighters and the decision-makers in the civilian government. A number of experimental explicatory designs are then proffered, described and analyzed with an eye toward their impact on the stake-holders in these issues. There is an extensive discussion on how these designs will optimally approach the issues in a way that would prove them sufficiently valid so as to render them reasonably immune to attacks that they too are biased. The goal set forth is to provide decision-makers, in both the defense establishment and in the energy departments, a look at the variety of approaches and the array of outcomes that may be in the offing. The paper concludes with a list of alternatives.

ABOUT THE AUTHORS

Mark C. Davis, Ph.D. is the Chief Technical Officer at Wood Duck Research, Inc, and is semi retired after careers in the US Navy and as a computer design engineer for both IBM and Lenovo. Rising to the level of Distinguished Engineer at Lenovo, he was responsible for the design of laptop computer cross-disciplinary technology, including PC architecture, embedded systems, open source and virtualization. Previous work was with IBM in the areas of software development and architecture involving security, storage and virtualization. Dr. Davis has been granted well over fifty patents that were filed during his service at both companies. He is a graduate of the Duke University NROTC program and was commissioned as an Ensign, attended nuclear power school, and served as a Submarine Officer for twelve years, including one duty tour as a classroom instructor. He left the active duty as a Lieutenant Commander to pursue a PhD. Mark holds a BSEE degree from Duke University and a PhD in Computer Science from the University of North Carolina, Chapel Hill, where his advisor was Professor Fredrick P. Books.

Jennifer H. Nolan, PhD, is the President of Catholic Polytechnic University and Professor of Psychology in their College of Arts and Sciences. Her earlier work specialized in genetic foundations of memory, dementias, stroke and insulin resistance. She is a brain plasticity specialist and certified Cogmed provider. Previously, she was the C.O.O. and co-founder of a stroke and brain injury rehabilitation center. Dr. Nolan has taught university courses at UC Irvine, Loyola Marymount University, and Glendale Community College. She has conducted local and nationwide clinical trials, and published in both scientific journals and popular magazines. Her doctoral dissertation focused on genetic variation and the examination of the incidence of genetic combinations within a specific population. She received a BA in Psychology from Loyola Marymount and a Ph.D. in Psychology from the Department of Cognitive Science at the University of California, Irvine.

John J. Tran, PhD is the Chairman of the Computer Science Department of the Catholic Polytechnic University and he retired as a Lieutenant Colonel in the California Air National Guard. He has worked at ISI, USC, the

Stanford Linear Accelerator Center, Safetopia, and Intel Corporation. At USC, he focused on Object-oriented software engineering, large-scale software system design and implementation, and high performance parallel and scientific computing. Air Force tours included the White House Communications Agency and Kirkuk Regional Air Base (Iraq), where he was the Communications Squadron Commander. He received both his BS and MS Degrees in Computer Science and Engineering from the University of Notre Dame and was awarded his PhD in Computer Sciences at the University of Southern California, where he was an advisee of Dr. Robert F. Lucas. His doctoral dissertation on quantum computing was entitled: Optimization of the Combinatoric Closely Spaced Objects Resolution Algorithm with Adiabatic Quantum Annealing

Dan M. Davis, CDR. USN, Ret. is a Research Associate Professor at Catholic Polytechnic University and a consultant at the Institute for Creative Technologies, University of Southern California (USC), focusing on large-scale DoD simulations and avatar uses. Prior to retirement, he was the Director of the JESPP project at USC for a decade. As the Assistant Director of Advanced Computing Research at Caltech, he ran Synthetic Forces Express, bringing HPC to DoD simulations. He also served as a Director at the Maui High Performance Computing Center and in computer research roles at the Jet Propulsion Laboratory and Martin Marietta. He was the Chairman of the Coalition of Academic Supercomputing Centers and has taught at the undergraduate and graduate levels. As early as 1971, Dan was writing programs in FORTRAN on one of Seymour Cray's CDC 6500's. While in the Marine Corps, he saw duty in Vietnam as a Cryptologist and retired in 2002 as a Commander, U.S.N. He received B.A. and J.D. degrees from the University of Colorado in Boulder.