

Efficient and Sustainable Energy: Ecology and Energy Challenges

Energy Efficient and Sustainable Buildings

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Innovative and Integral Building Technologies

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As “*Location, location, and location*” is the most important for Realtors, the “(Energy) *Efficiency, efficiency, and efficiency*” is the most important for energy processes - thus our all activities, which ultimate results in “*Quality, quality, and quality*” i.e., environmental sustainability and life happiness!

Brief, Non-Technical Statement of Proposed Activity:

To develop new and substantially enhance professional competence and critical activities at NIU as related to research area of the Department of Energy (DOE)'s [Building Technologies Program](#) (BTP). The goal is to develop comprehensive activities and proposal(s), with objective to obtain funding for research and application of existing and new materials and methods for *Retrofitting* existing buildings, and to develop a proposal for funding of a model “[Energy Efficient Building](#)” on NIU Campus, which will integrate all available energy conservation practices and technologies with renewable energy sources, and may house interdisciplinary energy & environmental programs, including Master of Energy Science and Technology (MEST) program, to be developed. Such model energy building should employ proven and the “cutting-edge” comprehensive buildings’ “*green & sustainable*” energy technologies and practices and develop new ones. The new “Energy Efficient Building” could be a *Model Energy Landmark* of the Northern Illinois Region, an inspiration for multidisciplinary “*Energy & Environmental Sustainability*” activities, education and outreach - in many ways to surpass objectives expressed in my prior energy initiatives.

Proposal Rational:

We are in 'energy transition era' from fossil fuels to alternative (including nuclear) and renewable energy sources (including solar, biomass, hydro, wind, and geothermal). In this transitional era, the energy conservation (including energy storage) is the most “efficient” and thus the most viable option in initial and mid-range period, until alternative and renewable energy infrastructure is developed and matured.

Energy consumption could be halved now on global scale with existing technology:

I would like to state, as a *professor of energy*, www.kostic.niu.edu/energy, that *energy conservation* “with existing technology” has real immediate potential to SUBSTANTIALLY reduce our national energy dependence until new yet-to-be-invented technology is available long-run. For example, at present, the Toyota Prius, commercial hybrid car makes double mileage than classical comparable car (double efficiency, 46 mpg vs. 23 mpg), and commercial Combined-Cycle-Power-Plant (CCPP), combining gas-steam turbines cycles, is about two times more efficient than classical comparable power-plant (about 60% vs. 30%), all commercial products with existing technology - **thus it could be done for any car and any power plant – energy consumption could be halved on global scale – two times less energy and pollution than current.** With energy conservation measures (*insulation and regeneration, cogeneration and optimization with energy storage*) it is even more straightforward to *substantially reduce energy use in buildings and industry*. We just have to make it a priority: invest resources in existing and new infrastructures and businesses and create new jobs to substantially improve equipment/product/process efficiencies in energy production and consumption sectors, while investing strategically in research and development. Life may be much happier after the fossil-fuel era, if we are wise to invest in, and work on national priorities instead of promoting and bailing out unethical greediness.

It is a very simple arithmetic: With existing technology and appropriate activities and investment (creating opportunities for many to work on national priorities) we can reduce energy consumption in HALF, which translates in proportional reduction of energy used and CO₂ environmental emission, thus substantially reducing energy imports and improving environment, national security and our economy.

Let us look forward to our “greener” and more prosperous economy and living!

An Energy/Resource Environmental Sustainability Initiative: ***Energy and Resources Conservation with an Objective to Reduce Budget Expenses*** ***while Improving Environment, our Opportunities and Image***

I propose that NIU initiate a vital campus-and-region-wide environmental sustainability activities with objective to reduce cost while developing, promoting and implementing energy conservation and measures of resource conservation and sustainability. Leading by example and expertise, those activities, if promoted and given due priority, should result in important savings, job market growth, and external projects beneficial to all in Northern Illinois region.

The right timing is now, due to need for savings and availability of new economical technology and expertise. We should establish a campus-wide *Sustainability Task Force* or similar entity, including staff, professors and students, as well as local business and government members and environmentalists, in order to initiate, promote, develop and implement conservation and sustainability measures. The proposed sustainability activities should be “*talk and action of the whole campus and wider community,*” including academic and student affairs’ divisions in addition to administrative affairs’ physical plant regular business.

We should encourage all students, faculty and community members to participate in the sustainability and conservation activities at NIU. We could do some exemplary projects - a critical conservation efforts that not only conserve energy and resources, but more importantly, save money and promote our institution image and opportunities towards the future job market growth.

A new campus-wide assessment related to building energy and water conservation, waste management and recycling, transportation, purchasing, research and curriculum and other related activities should be initiated. Even simple energy-saving techniques, like implementing energy-efficient lighting, enhancing insulation and reducing ventilation losses, low-flow faucets and shower heads, will be easy and exemplary projects, not to mention more advanced management and control of energy and other resource processes using “smart” sensors with microprocessor control, all integrated into computerized management systems. Now, and even more so in the future, new technologies prompted with continuous development of computerization, information- and nano-technology, are becoming more reliable and economical. Who could dare in past to predict current development of new and information technology, or that today’s hybrid \$20K cars could make close to 100 mile-per-gallon efficiency. Possibilities and opportunities are often beyond our beliefs.

We should demonstrate with our curricular and research activities that “*we believe in and care about*” the sustainability and conservation issues by leading and not falling behind regional, state, national and world-wide activities in these critical issues and promising opportunities for our graduates. It is our interest and responsibility to embrace and lead, and to prove that environmental sustainability and conservation can pay dividends, not just for us but for others in our region and for future generations.

M. Kostic

www.kostic.niu.edu/energy

NIU, April 2003

More at: **Energy & Environment:** www.kostic.niu.edu/energy

Also: **NIU Energy Initiatives:** [Importance and Freedom Field Potentials](#)

From: Prof. M. Kostic [kostic@ceet.niu.edu]

Sent: Friday, July 06, 2007 12:46 PM

To: Whomever It May Concern

Subject:

NIU Energy Initiatives - Importance and Freedom Field Potentials

"We may only succeed by leading with ingenious educative activities and innovative application activities, and not only by following others in acquiring their existing technology." by M. Kostic

The Freedom Field initiative and activities up to now are invaluable and should be commended. However, since the reality of global energy landscape has changed (from hydrogen to energy conservation and alternative and renewable sources) and is always changing, NIU now could help in further strategic planning and development of major funding for continuation and expansion of this unprecedented initiative. In addition to technological experts involved, there is a need for visionary, comprehensive and integral assessment (and YES, *Thermodynamics, a science of energy, and the Mother of All Sciences!*), and thus assist in critical decision making and energy development of our region. We have a unique opportunity to rejuvenate the "ailing" Freedom Field energy project – it is a unique initiative and could be much more important than what it appears to be – as one-of-a-kind energy landmark of our region and our nation, it may have enormous potential for economic growth and new jobs in our region, our nation, and globally.

I envision the Freedom Field as a very important energy landmark (of national importance, far beyond the Rockford Time Museum) with a mission of developing an energy vision, renewable and alternative energy resources, and energy efficiency technologies, similar, but scaled-down and uniquely adapted, to the National Renewable Energy Laboratory's (NREL's). The project should be both, educational (to provide public interest and support) and show-case of diverse, existing and future energy technologies (to stimulate existing and new businesses). It should be a unique, contemporary energy theme park/exhibition with up-to-date resources for growth of energy-environment related businesses. I strongly recommend development and implementation of fundamental and comprehensive energy conservation (now marginalized in the project) and other renewable and alternative energy resources, where new jobs and consumer market is and will be. An excellent example: the fast expanding hybrid cars ([Prius phenomenon!](#)) already ingeniously adapt, enhance and optimize the existing technology to substantially improve energy conservation and efficiency. The project/park should emphasize importance of energy management-and-conservation (improving efficiency) and diversity of energy resources (particularly alternative and renewable energy resources), as well as environmental pollution and safety.

The strategic/educational Energy Freedom Field's major themes should be developed to provide vision and guidance for future activities, fund-raising and development. We could discuss scope and priorities of eight (8) major energy activities as given in my recent [Encyclopedia of Energy Engineering and Technology](#) article [Energy: Global and Historical Background](#), and after thorough discussion and modification, decide on our future vision and main objectives and actions.

A probable scenario ... in the wake of a short history of fossil fuels' abundance and use (a bleep on a human history radar screen), the following energy future activities, in order of practical urgency but all (diversity) are critically important:

- 1. Creative adaptation and innovations, with change of societal and human habits and expectations (life could be happier after fossil fuels' era).**
- 2. Intelligent hi-tech, local and global energy management in wide sense (to reduce**

- waste, improve efficiency and quality of environment and life).
3. Energy conservation and regeneration have unforeseen (higher order of magnitude) and large potentials, in industry, transportation, commercial and residential sectors.
 4. Nuclear energy and re-electrification for most of stationary energy needs.
 5. Cogeneration and integration of power generation and new industry on global scale
(to close the cycles at sources thus protecting environment and increasing efficiency).
 6. Renewable biomass and synthetic hydro-carbons for fossil fuel replacement (mobile energy, transportation, and chemicals).
 7. Advanced energy storage (synthetic fuels, advanced batteries, hydrogen...).
 8. Redistributed solar-related and other renewable energies (to fill in the gap...).

Perhaps our greatest challenges, and thus opportunities, are in promoting and developing a sustainable future related to energy production and consumption. Energy is ultimately the basis for a large part of the global competitiveness, and more of it will be required to raise living standards in the developing world. Because of the fossil fuels' issues (nonrenewable limited supply, cause of pollution and possible climate change), finding sustainable, renewable alternatives is becoming increasingly urgent. Most probably new ideas and investment in related areas will be the most needed and profitable.

The two things are certain in not distant future: (1) the world population and their living-standard expectations will substantially increase, and (2) fossil fuels' economical reserves, particularly oil and natural gas, will substantially decrease. The difficulties that will face every nation and the world in meeting energy needs over the next several decades will be more challenging than what we anticipate now. The traditional solutions and approaches will not solve the global energy problem. New knowledge, new technology, and new living habits and expectations must be developed to address both the quantity of energy needed to increase the standard of living world-wide and to preserve and enhance the quality of our environment.

However, regardless of imminent shortages of fossil fuels the outlook for future energy needs is encouraging. There are many diverse and abundant energy sources with promising future potentials, so that mankind should be able to enhance its activities, standard and quality of living, by diversifying energy sources, and by improving energy conversion and utilization efficiencies, while at the same time increasing safety and reducing environmental pollution.

Sincerely,

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PS (See attached article):

More at: **Energy & Environment**: www.kostic.niu.edu/energy

Also: **An Energy/Resource Conservation and Environmental Sustainability Initiative**

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