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ENERGY and ENVIRONMENT: Fundamentals, Challenges and Potentials



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Synopsis:

Let us not be fooled by lower oil prices now due to unforeseen economic recession! If the *Global Warming* is debatable, the two things are certain in not distant future: (1) the majority of world population and their living-standard expectations will substantially increase, and (2) the 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 and environmental sustainability is encouraging. Energy conservation "with existing technology" (insulation, regeneration, cogeneration and optimization with energy storage) has real immediate potential to substantially reduce energy dependence on fossil fuels and enable use of alternative and renewable energy sources. 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.

The current challenges could be overcome by available and to be developed potentials: A probable scenario ... in the wake of a short history of fossil fuels' abundance and use (a blip on a human history radar screen), the following, sustainable 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 than thought) 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...).

Furthermore, advances in energy conversion and utilization technologies and increase in efficiency, including computerized control and management, contribute to energy conservation, increase in safety, and reduction of related environmental pollution. Actually, per capita energy use in the U.S. and other developed countries is being reduced in recent years. However, the increase of World's population and development of many underdeveloped and very populated countries, like China, India and others, will influence continuous increase of the World energy consumption and related impact on the environment.

After all, in the wake of a short history of fossil fuels' abundance and use (a blip on a human history radar screen), *the life may be happier after the fossil fuel era!*

Brief Biography of the Speaker:

Milivoje M. Kostic, Ph.D., P.Eng., Professor of Mechanical Engineering at *Northern Illinois University*, is a notable researcher and scholar in energy fundamentals and applications, including nanotechnology, with emphasis on conservation, environment and sustainability. He graduated with the University of Belgrade highest distinction (the highest GPA in ME program history), obtained Ph.D. at University of Illinois at Chicago as a Fulbright scholar, appointed as NASA faculty fellow, and Fermi and Argonne National Laboratories faculty researcher. Professor Kostic also worked in industry and has authored a number of patents and professional publications, including invited articles in prestigious energy encyclopedias. He has a number of professional awards and recognitions, is a frequent plenary speaker at international conferences and at different educational and public institutions, as well as member of several professional societies and scientific advisory boards.

More at www.kostic.niu.edu (See [C-Vita](#) for more information).