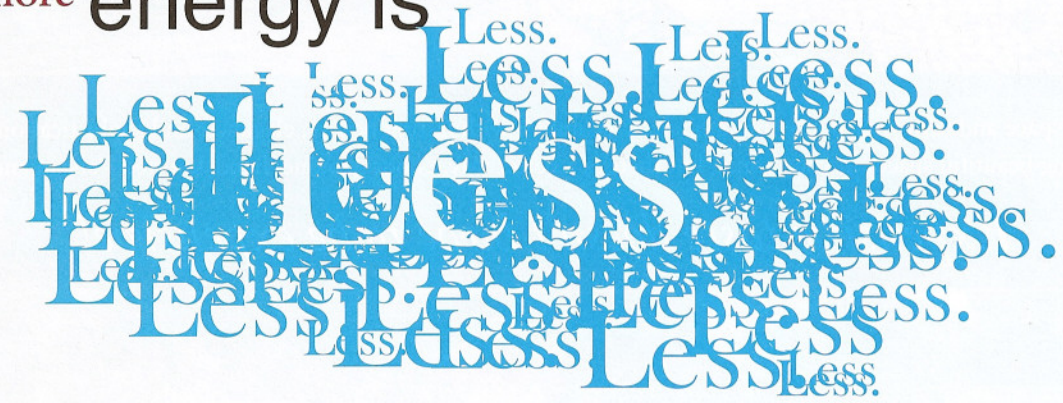
Environment 2.0:

more energy is Less.



A common response to pending climate change is to constrain energy use and, under the auspices of the United Nations, a number of countries have sought agreement on doing just that. On the face of it, and in light of a growing acceptance of the issue in some tough quarters (see stories this issue), the intellectual and political imperative would appear to be broad – after all, this is a global issue requiring global cooperation and coordinated management. But is it simply a matter of constraining energy use? Mechanical engineer **Duane Pendergast** argues that the real progress on climate change that will bring about next generation environmentalism will require more energy, not less.

As Edited by *AO* Staff

Somewhere between the engineer's cut and dried worldview and James Lovelock's grand mystical notion of Gaia – a "totality (of atmosphere, oceans, and soil) constituting a feedback or cybernetic system which seeks an optimal physical and chemical environment for life on this planet" – comes the general din of science in everything from atmospheric chemistry to zoology, all laying claim to one or more aspects of climate change.

The good news, bad news is that acknowledging our role in modifying the climate is encouraging for our long-term survival – interesting and ultimately important research, jobs and financial opportunities abound for scientists and others who develop or endorse evidence-based and market-driven solutions. The bad news is that in our urgency to see immediate results, we risk throwing the baby out with the bathwater. By making energy an "addiction" – or a deep moral issue – the basis of contemporary society quickly cashes out as a kind of sin, and we miss a fundamental reality: the key not only to increasing productivity but ultimately controlling our impact on the climate is to move forward to nearly inexhaustible energy supply.

It's timely that we already know this way forward.

The Carbon Cycle

It's well known that burning fossil fuels releases about 7 billion tonnes of carbon, as a component of carbon dioxide, to the atmosphere annually. Less well known is that life on earth produces and absorbs about 200 billion tonnes of carbon annually. And humans already manage some 24 billion tonnes through agriculture and forestry.

Clearly, with more careful mangement of the carbon that plants absorb, there is great potential to compensate for use of fossil fuels. We have already improved plant productivity with selection and breeding, irrigation and the use of fertilizers. And the potential for further improvement is substantial but will require still more energy to provide water and other services to take advantage of such possibilities.

Another idea currently being tested involves fertilizing the ocean to increase the uptake of atmospheric carbon dioxide by ocean life in anticipation that the organisms will sink to the bottom at death. Klaus Lackner of Columbia University has even suggested the development of separation facilities to remove carbon dioxide directly from the atmosphere, an idea that the Virgin Group's Sir Richard Branson is endorsing with his announcement of a $25 million prize to the first scientist who can develop such technology and make it commerically viable. We are familiar, here in Alberta, with several methods to sequester carbon dioxide from fuel combustion. These solutions tend to reduce the technical efficiency of energy use and, again, more energy would be needed to provide a useful end service.

Solutions that do not depend on carbon cycle management have also been proposed and studied and involve managing heat input to the earth – initiatives such as deploying mirrors or shades in space to direct more or less heat to the earth, or generating formation of clouds over the ocean by seeding the lower atmosphere with salt water to form water vapor nucleation sites. Again, energy would be required to establish such schemes, whether or not they are in some cases revealed as mere flights of fancy.

The upshot – it is important to emphasize that almost all of the proposed solutions will lead to even more human use of energy. The International Energy Agency indicates that we will be running short of oil before many more generations. Reserves of coal may be less than infinite. Perhaps our short-term priority should be to ensure our energy supplies for the future. We will need them if we are to have any hope of effecting control over atmospheric greenhouse gases.

Back to basics

The sun has often been the single-most powerful cultural and life-sustaining symbol in the collective human experience. It will be again.

Energy from the sun is in huge and effectively inexhaustible supply. Unfortunately, much of it falls on dry or otherwise infertile regions and its diffuse nature, the rotation of the earth, and the vagaries of weather make it difficult to economically utilize and apply to human needs.

Nonetheless, we have well-developed techniques to convert small quantities of energy from the sun into electricity with sophisticated and elegant solar cells, as well as through wind turbines designed and located to respond to wind currents driven by solar heating.

Some of the sun's energy drives the hydrological cycle, and we've successfully harnessed flowing water to produce a good fraction of world electricity needs. Solar energy is also implicated in the making of alcohol from cellulose and diesel fuel from vegetable oils, although photosynthesis is inefficient at converting sunlight to energy and raises the specter we could soon exhaust our soil and water resources.

As Massey University's Peter Read states: "There is plenty of land. What there isn't is investment in land." Perhaps it is possible that technology can be established to tap into the ability of plants to absorb carbon dioxide from the atmosphere and at the same time "invest" the carbon bearing products of plant growth into building more, and more fertile, land.

Back to the future

The real sleeper in the energy story, though, is nuclear fission. Intense interest over three or four decades following WWII has developed the basic science and technology needed to provide supplemental energy for the planet indefinitely. We hear of safety problems with reactor accidents and the handling of waste; what we don't hear, however, is that some 500 reactors are running quietly and efficiently.

Still in its first generation of development, nuclear already accounts for some 15 per cent of the world's electricity but what we also don't hear is that the so-called "waste" – spent fuel from our first generation reactors – represents a nuclear fuel supply from which less than one per cent of the energy has been extracted. Reactor systems and nuclear fuel processing systems have been established and tested that are able to utilize all the energy from spent fuel and mined uranium while at the same time consuming the long-lived components of current nuclear waste. And there is enough recoverable uranium on the planet to supply much more energy than we now use to beyond the foreseeable future.

Forever on the bright side

We have learned how to use energy. We are learning how climate works and we may have the power to modify it. Our existing knowledge combined with our ability to think and learn allows us to fulfill our role to turn apparent obstacles into opportunities for the future. AO

Dr. Pendergast worked for several years on Canada's climate change plans on behalf of the Canadian Nuclear Association. Visit his website – www.computare.org – where alternative thinking on the use of energy to increase the productivity of the planet while removing and keeping greenhouse gases from the atmosphere is presented.