

The Energy Sustainability Dilemma: Powering the Future in a Finite World

J. David Hughes

Climate change is on the public radar and in the rhetoric of politicians, but will likely have to be dealt with even if CO₂ emissions were reduced to zero tomorrow. The issue of physical limits to our profligate and expanding levels of energy consumption, and what this means to the continued viability of current socio-economic structures, is much less understood. The Energy Sustainability Dilemma is now unfolding and will profoundly impact our children and all future generations, unless the finite nature of non-renewable resources is clearly understood and managed for long term sustainability.

The limits to our ability to ever grow energy supply from non-renewable resources are now becoming evident. More than half of the world's oil production comes from countries that are past peak production. Estimates of the timing of the peak of global oil production range from now to as late as 2040, with a mean estimate in the 2012-2014 timeframe. Peak oil production in North America has already happened - the U.S. peaked in 1970, Mexico in 2004 and only Canada is now able to grow oil production thanks to the tar sands. Peak North American natural gas production happened in the early part of this decade and a global peak of gas production is forecast to occur before 2050. Natural gas is not expected to be able replace the energy lost from the depletion of oil supply after the peak in global oil production. Other forecasts suggest that global peak coal production, once considered an energy resource for "hundreds of years", could occur as early as 2025. Although there is a debate in the timing of peak production of oil, gas and coal among energy experts, the debate is only about "when", not "if". Given the sheer magnitude of the contribution of non-renewable hydrocarbons to our energy consumption, the peaking of production of these fuels has profound implications for our modern way of life, unless we move toward more sustainable levels of consumption. Increasing global conflicts related to energy, Iraq and Nigeria come to mind, are yet another consequence of an unsustainable energy future.

Fossil fuels will of necessity be part of our energy mix for a very long time given that they currently provide 86% of primary energy consumption. Their dense energy will be required to build a more sustainable infrastructure, as renewable and reduced consumption technologies such as wind, photovoltaics, geothermal, tidal and mass transit require large inputs of fossil energy to mine, transport and refine the materials used in their construction. The key is to understand the necessity of utilizing this one-time gift of fossil energy to maximum benefit in meeting current needs and developing the infrastructure for the next paradigm, which is a sustainable steady state future, rather than continuing the deployment of both fossil fuels and capital in an unsustainable growth paradigm, which is the current political mindset.

This presentation focuses on the "Big Picture of World Energy" and how Canada and the United States fit into it, as well as what must be considered going forward to assure a more sustainable energy future.