Future Energy: Opportunities and Challenges

Part IV. Creating Sustainable Energy

Chapter 21. Energy, Economics, and Government

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Future Energy:
Opportunities and Challenges

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21
Energy Economics and Government

The Main Points

- **World population growth will cause increases in energy demand.**
- **U.S. per capita energy consumption is about twice that of western European countries and 8-1/2 times that of developing countries.**
- **Resource availability and environmental protection concerns will limit growth in energy use and in the world economy.**
- **Technical advances like those that enabled earlier growth are unlikely.**
- **Government and economic policy must eventually adapt to a no-growth situation.**

21.1 Introduction

Previous chapters should have made it clear that achieving a sustainable energy supply that satisfies human requirements is a huge challenge. We must implement one or more of the following steps:

- Produce more energy
- Stabilize or decrease population
- Reduce per capita consumption

Energy supply is strongly coupled with economic forces and government policies. This coupling is the stuff of economics and politics, subjects outside of the main focus of this book. Nevertheless, their importance in determining our energy future warrants a short detour into these subjects.

21.2 Energy Production

Future energy production decisions will be driven by three considerations: the declining availability of traditional energy resources, the relative costs of energy options, and concerns about environmental damage caused by the use of energy resources. In spite of these concerns, it is certain the world's energy demand will increase.

21.3 Population

A major reason for the increase in world energy demand will be increasing populations of citizens in developing countries who want the lifestyle benefits of increased energy use.

Currently, birth rates are decreasing, but they remain high in developing countries. Demographers estimate the world population will stabilize in the mid-twenty-first century at about 50 percent higher than the current population (see Chapter 14).

21.4 Per Capita Consumption

In 2010, the U.S., with only about 5 percent of the world's population, accounted for about 20 percent of the world's energy use. The existence of much lower per capita consumption in some other advanced nations suggests that America could reduce consumption without huge changes in lifestyle. For example, the 2010 per capita energy consumption as a percentage of U.S. per capita consumption in three large European countries is as follows: France (51 percent), Germany (50 percent), and Great Britain (47 percent). Furthermore, even these economies have waste that could be eliminated, further reducing consumption. These statistics give support to the assertions by some that the U.S. could reduce its per capita consumption by half without excessive difficulty. Of course, there are also those who say that European conditions are so different from U.S. conditions that comparisons are useless.

U.S. energy policies and consumption habits do not function in isolation. The rest of the world consumes four-fifths of world energy production, and important changes in consumption patterns in these countries are imminent. Even if the U.S. decreased its energy consumption to half of its current level, world energy consumption would decrease by only about 10 percent. The U.S. per capita energy consumption is now about 8-1/2 times that of citizens in countries that are now classified as "developing."

China and India, with about one-third of the world's population, are increasing their energy appetites significantly, and much greater increases are anticipated in the near future. The economies and the lifestyle expectations in the huge populations of these countries are growing rapidly. Total energy consumption in China grew to equal U.S. consumption in 2009. In the early twenty-first century, the per capita energy use in China and India is small compared to the U.S. because of much larger populations in those countries (23 percent of U.S. per capita consumption in China and 6 percent in India). People in these and other developing countries will certainly demand the energy needed to improve their lifestyles. There will be intense competition for energy resources and a strong temptation to ignore environmental effects in the rush to increase energy production.

21.5 Economics

Economics, often called the *dismal science*, is the discipline concerned with the allocation of scarce resources to satisfy human wants. So long as humans cannot have everything that they want, scarcity is said to prevail. Human wants include those things that are essential (food, water, shelter, energy) and those things that add convenience, comfort, entertainment, and culture to human existence.

World population, economies and energy consumption have been growing exponentially for many years. Predicting future economic conditions is hampered by the non-intuitive nature of exponential growth. People tend to think in terms of linear change but growth generally proceeds exponentially (see Section 2.11).

There is a fundamental conundrum in economics: *All economies are designed to grow continuously, but resource availability and environmental protection impose an inescapable upper limit on growth.* The states of national economies are measured by their gross domestic products (GDP), and the states of businesses are measured by their annual profits. Failure is indicated by a decrease in GDP or profits. But this growth cannot continue indefinitely. The question is not whether there are limits to growth, but whether the world is close enough to these limits to necessitate attempts to adapt to them.

Economists and politicians pay little attention to the future impact of resource availability and environmental effects on economic policies. Discussions about the link between economics and energy production usually focus on two issues: the failure of prior predictions of economic hardship caused by resource (especially energy) unavailability and the link between energy costs and economic growth.

Predictions of the catastrophic consequences of resource depletion have appeared repeatedly in the past. The most famous is probably Thomas Malthus' eighteenth century prediction of chaos caused by population increases that would outstrip the world's ability to meet basic survival requirements with available resources. Malthus and most of the subsequent prognosticators failed to account for the technological advances that would expand the earth's carrying capacity. For example, prognosticators failed to account for the Industrial Revolution in the nineteenth century and the Green Revolution in the twentieth century.

Many economists now rely on "the lessons of history" to posit that technology will provide the means to enable sustainable and continued growth in population and consumption. However, a growing number of analysts believe we have finally reached the start of a new era, in which resource unavailability and/or environmental issues will prevent continued unrestrained growth[1].

Economists, including those involved in formulating U.S. economic policy[2,3], often speak out on the link between energy and economics, but the focus is on the impact of energy prices on economic growth. The objec-

tive is low energy prices and continued economic growth. It is now obvious that the need to deal with short-term issues is in direct conflict with the need to deal with the long-term issue of inevitable growth limits.

Eventually, the objective in economic policy must change. There must be a transition to a new economy in which growth is stopped in order to enable a sustainable condition. The inevitability of this requirement is certain, but the necessary schedule is very uncertain. Some say that the time for action is so far in the future that it does not warrant concern. Others say that the time for action is now.

The connection between resource availability and economic growth was addressed in a 1972 study by The Club of Rome and documented in the book titled *The Limits to Growth*.[4,5] This book, with 30 million copies sold in 30 different languages, has stimulated debate, but its conclusion is undeniably correct. *Growth cannot continue forever.* The main theme of *The Limits to Growth* is echoed in other, more recent publications.[6,7]

21.6 Government

Throughout history, citizens of the countries of the world have debated and fought over decisions about the form of government that suits them best. At one extreme is government that embraces free-market capitalism. At the other extreme is government that embraces central planning by an individual (in absolute monarchies and dictatorships) or by a bureaucracy (in socialist systems) to control production and the distribution of wealth. No countries now operate at these extremes. Instead, they operate systems that involve a mixture of these disparate philosophies.

The economic and government philosophy in the U.S. supports a free-market, capitalistic system. It is based on the belief that the laws of supply and demand and the striving for personal gain will work to the betterment of everyone. However, the need to share the cost of certain activities that are deemed desirable has led to departures from pure capitalism. Medicare, welfare, punitive taxation, graded income tax, subsidies for certain industries,

and minimum wage laws are all examples of central planning that influences the distribution of wealth.

Governments have a crucial role in bringing about a transition to energy sustainability. Taxes, regulations, subsidies, education, persuasion, and research funding are tools available for government to influence the direction and rate of a transition to sustainability. Decisions about the form and extent of government policies are made by bureaucrats who have imperfect knowledge and insight and whose decisions are influenced by their personal beliefs and philosophies. Heavy government involvement will certainly be anathema to those citizens and politicians who favor minimum government central planning and control. Nevertheless, governments clearly must eventually adapt to an unavoidable no-growth policy.

In the early twenty-first century, the U.S. and the world experienced an economic recession. Many believe it was caused by so-called "casino economics." People made investments, primarily in real estate and the stock market, essentially betting that values would continue their pattern of rapid growth. When apparent assets plummeted in value as real estate and stock values dropped, the U.S. government responded by providing funds to encourage a return to growth. Government measures included bailouts of troubled sectors of the economy (mainly financial institutions and auto manufacturers) and tax rebates to citizens. These steps were designed to encourage production and consumption. These steps helped in returning to a growth economy, but there was little indication of any inclination to use the slowdown as an opportunity to begin a transition to sustainability (an exception was encouragement of auto manufacturers to produce more fuel-efficient vehicles).

Dealing with future energy supply shortages will force consideration of major restructuring of the U.S. and world economic and government systems. The main question is, "How can per capita consumption be reduced while maintaining the incentives for innovation and improvement that are inherent to the free market system?" This issue will inevitably arise in the future, and it is important for economists, politicians and private citizens to start planning for the transition.

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