

government and entrepreneurs must make in such an environment of technological breakthroughs requires a shift in practice of economic forecasting into emphasis on the foreseeable, direct causal relationship between specific classes of advances in technology and resulting changes in rates of per-capita productivities and general economic growth.

To analyze the impact of technology in this way for effects on the economy as a whole, it is necessary to measure economic performance explicitly in terms of net increase in potential relative population-density.

This begins with an estimated census of households (the irreducible unit of reproduction and maturation of new individuals), and the correlation of total population and its growth-rates with demographic characteristics of classes of households. The labor-force must be measured in total as a characteristic demographic feature of households. The demographic analysis must study the composition of households and total population by functionally defined age-intervals.

The total land-area of the United States must be analyzed for functional characteristics of use, for urban and rural households, agricultural production, industrial production, and so forth. The relative quality of land, as this bears upon potential relative population-density, must be correlated with land-use data.

In this setting, a more rigorous study of basic economic infrastructure must be conducted and the relevant data maintained. This includes water-management, transportation, energy production and distribution, and basic urban infrastructure. At present, since infrastructure is chiefly a function of government and public utilities, economic reporting for the economy as a whole virtually ignores this category of the economy. Estimates of economic growth and contractions presently fail to appreciate the effects of failing to expend governmental funds at federal, state, and local levels for maintenance of this essential infrastructure. The deficit incurred over the past decade totals to an estimated \$3-\$4 trillion at present! If infrastructure collapses through lack of maintenance and improvements, the whole economy, which rests upon that infrastructure, must come toppling down. . . .

We require the kinds of general economic and management information this turnaround implies. We require the readings on the economy which enable decision-makers to trace out the efficient connection between changes in technologies and the effects of those changes upon potential relative population-density. Gross National Product is the wrong yardstick, increasingly a misleading yardstick: The addition of the salary of an added clerk in the factory's offices is not an increase in the factory's saleable output, and does not replace the shrinkage of production in the factory itself. We must shift to the yardsticks the situation now requires.

This indicates the direction of improvements in *EIR's* forecasting practices which are beginning step-by-step implementation now. Our former forecasting has been proven the best available, indeed the only competent forecasting publicly available. That was good, but not good enough for the tasks our economy faces now.

Scientists open path to the plasma age

by Marcia Merry

Breakthroughs in the science and engineering of lasers and plasma energy systems point the way into a Plasma Age of unprecedented growth potential. Most of the 1983 developments—involving fusion energy, laser medicine and biological research, and plasma metallurgy are taking place in an international network of the U.S. national laboratories and collaborating research centers in France, Japan, India, and elsewhere, the core of which in the United States are centers for classified work on directed energy defense systems.

These breakthroughs are occurring despite the lack so far of a federal government commitment to a Manhattan Project-style crash program for energy beam defense systems, which would create a shower of spin-offs whose application would transform the now-collapsing economies of the world into powerhouses for population growth and space colonization.

According to most intelligence reports, the U.S.S.R. is ahead of the West in areas of beam defense development. However, the Soviets are working on these systems in a secret, Hitlerian "wonder weapon" approach, to be deployed to blackmail the world into submission or face nuclear annihilation.

Therefore continued scientific advances are key to both neutralize this threat and simultaneously provide the productivities to lift the world out of economic collapse. A computer projection study done by the *EIR* and the Fusion Energy Foundation in May, 1983, shows that a beam-defense development program would double its industrial productivity in 10 years and add 4 million jobs to the U.S. economy.

It is essential to implement these productivity gains soon, both because of the strategic war threat and the rate of economic collapse. The austerity policies in force under the International Monetary Fund, World Bank, and related institutions have caused the physical deterioration of whole sections of continents—the formation of dustbowls, increase of death rates, and the appearance of new diseases. Currently, the level of world food output has shrunk to 16 bushels of grain or less per capita, from 18 bushels in 1980. To provide a decent diet, 24 bushels of grain are required per capita. The population potential of the world is falling.

Polarized fuel brings fusion energy closer

The world is in urgent need of increased energy through-

put to reverse the decay and upgrade living standards, and fusion energy—literally, the power of the sun—is now closer than ever to realization.

In September, Dr. John Nuckolls of the Lawrence Livermore National Laboratory announced in London that a breakthrough had been made in the progress toward controlling fusion reactions for commercial energy generation. Preliminary test results this year indicated that by polarizing the fuel used in the reaction, the energy input required to start the fusion burn process could be reduced nearly tenfold. Dr. Nuckolls estimated that this can cheapen the cost of building commercial fusion reactors to half that of coal burning generators or fission reactors. The energy output is enormously greater.

Fusion energy results from the forcing together of two hydrogen nuclei under conditions of very high temperature and pressure. The fusion of the two nuclei produces a nucleus of helium, with a mass less than the sum of the masses of the two hydrogen nuclei, and releases an enormous amount of energy. Whether the nuclei fuse together or not depends on their spin alignment. In ordinary, unpolarized fusion fuel, the spin alignment of the nuclei is arbitrary and only some of the atomic nuclei are caused to fuse. However, if the spins of the individual nuclei can be arranged to have their spin oriented (polarized) in the same direction, the reactivity of the fuel is increased—more reactions will take place for a given amount of fuel—increasing the efficiency of the process. Most scientists did not expect polarized fuel to remain in alignment long enough under the confinement conditions for the fusion reaction to begin, but they were proved wrong.

The containment of the fusion process is accomplished either by magnetic fields or by inertial methods, as in laser fusion. The polarized fuel breakthrough will accelerate progress in all types of fusion-machine development. Magnetic fusion is still in the lead for achieving conditions of commercial performance levels. The Princeton TFTR—Tokamak Fusion Test Reactor, which first went on line Christmas eve, 1982, is expected to reach levels of net energy generation in another year. Alternative fusion devices, such as the spheromak, are also making progress.

The introduction of fusion energy will mean much more than a new, cheap source of electrical power. Through the development of related technologies, such as the fusion torch, it will become possible to convert raw Earth and garbage into absolutely pure elements. Forecasts of resource and energy shortages based on existing technologies will become laughable.

There are even greater theoretical implications. In the case of an H-bomb, or a fusion burn of unpolarized fuel, the energy is released isotropically, that is, in all directions. With polarized fuel, the neutron output from the burning fuel sphere takes the shape of an expanding disk coming out of the equator of the pellet. This directed energy makes the direct production of electricity, or whatever form of final energy output desired, very flexible.

Work is now going on with the hydrogen bomb to employ the self-organizing nature of plasma to shape the energy release into coherent radio and microwaves. This is called the microwave bomb, or M-bomb. We can expect that plasmas can be developed to generate microwaves to allow new methods of medical diagnosis. This will be even more refined than the latest generation NMR—nuclear magnetic resonance.

High-powered lasers

There are a number of revolutionary breakthroughs underway, from the high energy to the microwave end of the electromagnetic spectrum, which compare in impact only to the rapid development and application of control of the low end of the electromagnetic spectrum one hundred years ago. In 1870, there were no telephones, no electricity, no radios; within 40 years the situation was transformed.

Twenty years ago the first lasers appeared, named for the process involved: light amplification through the stimulated emission of radiation. But in 1960 a laser could harness only the energy equivalent of a match. Today, the new x-ray laser possesses the energy equivalent of a small nuclear bomb.

There were significant developments this year in the free electron laser (FEL) and the KrF—krypton fluoride—eximer laser.

In June 1983, scientists at France's Orsay Laboratory for the Utilization of Electromagnetic Radiation reported that they were able to extend the operation of their FEL to significantly shorter wavelengths and greater levels of control. The FEL is based on injecting an electron beam into a magnetic field in association with a laser beam. By altering the strength of the electron input and the magnetic field, the electron beam output can be "tuned" to desired wave-lengths. The breakthrough involved shortening the wave-length to about 0.6328 micrometers, at low-beam power levels of about 50 microwatts.

The FEL promises to be the "electric motor" of the plasma age. It can be used in optical communications, isotope separation, metal cutting and finishing, photochemistry, inertial confinement fusion, and anti-missile beam weapons. It could be used for long-distance power transmission itself. Given a network of orbiting mirrors and FELs, electricity generated on the night side of the world could conceivably be transmitted in the form of laser beams at 20 percent efficiencies to the day side, and be reconverted into electricity with solar cells at the receiving sites.

The same FEL-orbiting mirror system could be utilized to increase the rate at which agricultural crops are grown. Both field station experiments and arctic farming show that constantly irradiated plants grow exponentially faster and that a larger, healthier plant results.

Life sciences

The advancement of the x-ray laser promises to revolutionize biology and the understanding of life processes. At year end, experiments were underway at Nevada test sites to

use x-ray lasers to create microholograms—pictures of living cells.

With laser microholography, the interior of cells can be viewed, at a trillionth of a second in time. As of now, the cytoskeleton of a cell is invisible. The microhologram will show the structure.

The x-ray laser is simply a very short wave-length beam, which until recently was almost impossible to produce and control. The power source at present is literally a small nuclear explosion. But the shaping of the detonation through geometric fuel configuration presents new opportunities. The new Nova laser, now under construction at Lawrence Livermore and due to be completed in 1985-86, will be capable of laboratory experiments producing microholograms of cells.

This powerful tool promises to produce results which will transform the conceptual foundations of today's biological research, which is currently mechanistic, with virtually no understanding of what distinguishes living processes from any other energy configuration. This lack stems from an Aristotelian "molecular science" approach, and parallels the quark orientation in physics.

Nevertheless, there are some very recent advances in biotechnology and laser medicine whose immediate application will have far-reaching results in agriculture and health.

Over the year, laser surgery, already in use in most medical specialties, was perfected to new levels and was used successfully in France in four cases of coronary artery surgery, and in leg-artery surgery in California and England. Advances continue in the development of the artificial heart, though opponents to its widespread availability have refused to allow another test case. With proper backing and funding, the mechanism could be widely available in three years.

Doctors in New York state reported this fall the success of a multi-valent vaccine, which can protect against several diseases at once. In tests so far, genetic engineering has grafted antigens to several diseases onto the vaccinia virus, long used in small-pox vaccination. Within only three years or less, this "poly-vaccine" could be used to drive back the major global killer diseases—hepatitis-B, malaria, influenza strains, and others. The cost per shot of hepatitis vaccine would fall from \$100 to 35¢.

Genetic engineering has been used to develop the means to protect crops from frost damage, which could increase citrus and other output by 20 to 30 percent a season in several latitudes. Viruses have been isolated which can be turned loose on citrus groves, in the event of frost warnings, to attack and destroy specific bacteria which otherwise serve as "seeds" around which frost crystals form and destroy crops. In the daylight, these viruses die.

A lawsuit was filed in late 1983 to stop the anti-frost viruses and other genetic engineering advances, on grounds of "non-interference in nature." The leader of the action, propagandist Jeremy Rifkin, is part of the nuclear freeze movement, which also wants to ban energy-beam advances for defense and advanced technologies.

NEW EIR REPORT NOW AVAILABLE:

The Economic Impact of the Relativistic Beam Technology

A unique study of the impact of the new defense-related technologies—high power lasers, particle beams, and fusion—which will become available to basic industrial production as the March 23 defensive strategic doctrine proposed by President Reagan is developed. The report is a computer analysis incorporating the LaRouche-Riemann model, which examines the little-discussed revolutionary civilian economic "spinoff" effects of the new beam weapon development program.

The study reveals that with rapid introduction of new laser and related technologies into the civilian economy, the growth of the economy would be so rapid that:

- an estimated 4 million highly skilled industrial jobs could be added to the economy per year;
- the U.S. trade deficit could be eliminated in two years; and
- the rate of growth of real GNP could approach 25 percent per annum.

Over a period of two years, 50 percent of the current stock of machine tools in industry could be replaced with laser machining stations, increasing productivity in this sector 300 to 500 percent. Plasma steelmaking, now in the commercial development stage, could become available for large-scale use over the next decade. The study concludes that the major constraint on how quickly the economy can expand and create wholly new industries is the speed with which new baseload electric-generating capacity can come on line.

scale use over decade. The study major constraint on economy can expand and create wholly new industries is the speed with which new baseload electric-generating capacity can come on line.

This EIR Special Report is available for \$250.00. Contact: William Engdahl, EIR Special Services, (212) 247-8820 or (800) 223-5594 x818