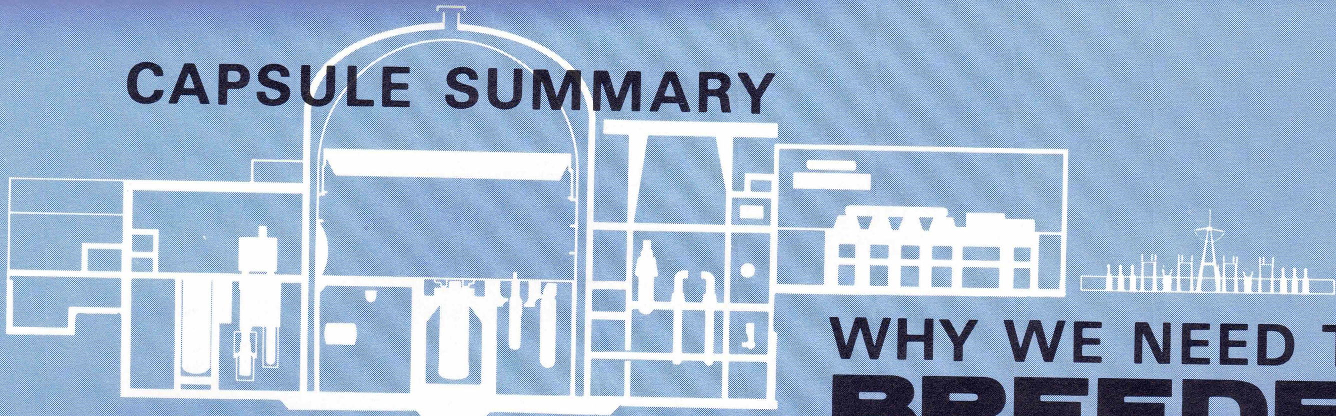
CAPSULE SUMMARY



WHY WE NEED THE BREEDER

Development of the liquid metal fast breeder reactor (LMFBR) is an urgent necessity to insure that the future energy needs of the country are met. This conclusion is based on the following facts:

1. IN THE U.S., OUR WAY OF LIFE AND OUR ECONOMY DEPEND ON HAVING AMPLE ENERGY AVAILABLE.

   a. Historically, there has been a close correlation between real gross national product (GNP) and the use of energy.

   b. Last year (1976), a 3.6% increase in energy consumption correlated with a 6.2% increase in GNP. The unemployment rate in 1976 decreased 0.8% over the 1975 rate to 7.7%.

2. DOMESTIC OIL AND GAS ARE SCARCE, AND BOTH WILL SOON BE UNAVAILABLE.

   a. Our gas and oil, excluding oil shale, comprise only about 10% of total estimated economically recoverable energy resources, but, together with oil and gas imports, are relied upon for about 75% of our energy.

   b. Even if the usage of oil and gas could be held at current levels, our domestic gas supplies will run out in less than 35 years and domestic oil in less than 50 years. If growth in energy consumption continued at the historical rate of 4%, our oil and gas supplies will be gone around the end of the century.

   c. Domestic production of oil has already peaked and is now declining.

   d. In 1976, we imported about 42% of our oil needs.

   e. In 1976, imported oil cost the U.S. about $37 billion. If we continue to use oil imports to meet our increased energy needs, these costs will increase to about $62 billion in 1985 and about $120 billion in 2000 (for a constant $13/barrel price for oil).

   f. Oil and gas must be conserved for other important uses such as petrochemicals, plastics, fertilizers, textiles and aviation fuel.

3. ALTERNATE SOURCES OF ENERGY SUCH AS SOLAR AND GEOTHERMAL CAN PROVIDE ONLY A SMALL PART OF OUR NEEDS.

   a. Solar energy might provide about 5% of our energy needs by the year 2000, mostly to heat and cool buildings.

   b. Hydro power should contribute approximately 3% of our total energy needs in the year 2000.

   c. In the U.S., tidal ranges suitable for producing tidal power are too limited. Even if potential sites are fully developed, their contribution to our national energy needs will be negligible.

   d. Geothermal power generation is limited geographically. It could provide only 1% of our needs by the year 2000.

   e. The efficiency of ocean thermal gradients is so low and the cost of harnessing this energy is so high that its impact on the energy supply situation in the year 2000 will be negligible.

   f. Windmills as an energy source may supply up to 1% of our energy needs by the year 2000.

   g. Fusion is a great potential energy source, but technical feasibility has not yet been determined. Even with increased developmental effort, no significant contribution to the commercial energy sector can be expected before several decades into the next century.

   h. All alternate sources together might supply up to 10-15% of our energy needs by 2000.

4. WE MUST INCREASINGLY RELY ON COAL AND NUCLEAR FUELS FOR OUR FUTURE ENERGY NEEDS.

   a. Coal comprises more than 75% of our recoverable fossil fuel resource (proven plus potential), but contributes less than 20% of our total energy utilization.

   b. Uranium used in light water reactors comprises about 10% of our total estimated energy resources (proven plus potential), but contributes 2% of our energy utilization (8% of electrical generation). Uranium used in LMFBRs would provide about 90% of our energy resource and increase our total estimated economically recoverable resources approximately ten-fold.

   c. Use of coal and uranium must be expanded greatly.

   d. Problems to be overcome with increased coal use are mine safety, additional capital equipment, environmental effects, transportation and strip mining reclamation.

   e. In the first half of 1976, the average cost of generating electricity (including fuel and capital costs) was much lower with nuclear plants than with fossil fueled plants:

      Nuclear - 15 mills/kW hr.
      Coal - 18 mills/kW hr.
      Oil - 36 mills/kW hr.

f. There are practical limits to expanded use of uranium:

Known domestic reserves of high-grade ore, 780,000 tons, will be committed to light water reactors (LWRs) by the early 1980s.

Potential undiscovered domestic resources, 2.9 million tons of high-grade ore, will be committed to LWRs during the 1990s.

5. THE LMFBR IS BY FAR THE MOST VIABLE OPTION FOR PROVIDING POWER AT A REASONABLE COST IN THE NEXT SEVERAL DECADES.

a. Natural uranium is composed of less than 1% uranium-235 and more than 99% uranium-238.

b. Light water reactors are fueled with uranium slightly enriched with uranium-235 while the LMFBR uses man-made plutonium and uranium-238 enrichment tailings.

c. The LMFBR uses 60 to 70 times more of the energy available in uranium than light water reactors.

d. Some plutonium is produced by light water reactors and this plutonium will be used to fuel the first LMFBRs.

e. Enough uranium-238 will be left over from uranium enrichment operation for LWRs to provide fertile material for breeders for centuries.

f. A commercial breeder will make enough plutonium from uranium-238 to refuel itself and another reactor every 10 to 15 years.

6. PRESENT-DAY AND BREEDER REACTORS HAVE A MINIMUM EFFECT ON THE ENVIRONMENT AND ARE SAFE.

a. The air emissions from a typical LMFBR power plant are virtually nil and the thermal efficiency of the LMFBR is higher than a LWR of current design and comparable to modern fossil-fueled plants.

b. Because the LMFBR can utilize the uranium-238 enrichment tailings as a fertile material to produce more nuclear fuel, the LMFBR industry will not require mining of uranium, with its environmental drawbacks.

c. A typical LMFBR power plant (1000 MWe) will produce only 55 cubic feet of solidified high-level radioactive waste each year. If all the electricity in 1975 had been generated by LMFBRs, the high-level waste would have formed a cube about 30 feet on a side.

d. High-level radioactive wastes will be solidified prior to permanent disposal as protection against release of radioactivity to the biosphere.

e. A variety of geological formations in a number of locations are currently being investigated as sites for the permanent disposal of solidified high-level radioactive waste.

f. Bedded salt mines appear to meet all the necessary requirements for permanent geologic disposal. A prototype disposal plant is planned for the mid-1980s.

g. Plutonium has been handled safely without injury to the public for 30 years.

h. In 1944, 25 workers were exposed to plutonium at 100 times the general public allowable dose. No cancers or other harmful biological effects due to exposure have been observed.

i. Plutonium safeguard methods exist and are being improved to insure that the risk of diversion of plutonium is well below the acceptable levels.

j. The study of safety of light water reactors directed by Prof. Norman Rasmussen of MIT concludes that the risk and the consequences of reactor accidents to the public are very small.

k. The LMFBR is being designed to be as safe as present-day light water reactors.

l. The safety design of the LMFBR is backed by considerable experience in building and operating liquid sodium fast reactors since 1951.

7. THE BREEDER CAN BE A COMMERCIAL REALITY IN TIME TO MEET OUR LONG-TERM ENERGY NEEDS.

a. The current LMFBR development program includes:

Fast Flux Test Facility (FFTF)
Clinch River Breeder Reactor Plant (CRBRP)
Prototype Large Breeder Reactor (PLBR)
Base Technology Program

b. The total cost of the program to develop the LMFBR to commercial status is estimated to be approximately $12 billion. Assuming introduction of the LMFBR, in the early 1990s, the savings in power cost from plants built through the year 2020 is estimated at $1 trillion, 600 billion.

c. The cost of the Clinch River Project is presently estimated at $1,950 million. The increase from the 1974 estimate of $1,736 million is due primarily to the 15-month schedule stretch-out as well as scope changes and hardening of the cost estimate.

d. CRBRP is scheduled for completion in 1984 at Oak Ridge, Tennessee. Its purpose is to demonstrate that the LMFBR can be licensed and operated reliably and safely within a utility system.

e. Construction of the FFTF in Hanford, Washington, will be completed in 1978. This facility will be used to test fuel performance and the behavior of other reactor materials.

f. The LMFBR is the most technically advanced of the long-term energy sources and, in light of the uncertainties for solar-electric and fusion power, must remain a high priority development project if this nation is to have an assured source of electrical energy in the 1990s.

Compiled by Westinghouse Electric Corporation for Breeder Reactor Corporation

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