DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

Withdrawal of an Expired Proposal for Listing of Eight North American Beetles; Endangered and Threatened Wildlife and Plants

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of withdrawal of an expired proposed rule.

SUMMARY: As amended November 10, 1978, the Endangered Species Act mandates withdrawal of proposed rules to list species which have not been finalized within two years of the proposal. The amended Act also authorized a 1-year suspension of all withdrawals, until November 10, 1979. The time limit has expired for eight North American beetles which were proposed with Critical Habitat on August 10, 1978 (43 FR 35636–43). These species are Beller's ground beetle (*Agonum belleri*) (Endangered), the Sacramento anthicid beetle (*Anticus sacramento*) (Threatened), the globose dune beetle (*Coelus globosus*) (Threatened), the San Joaquin dune beetle (*Coelus gracilis*) (Threatened), the Mojave rabbitbrush longhorn beetle (*Crossidius mojavensis mojavensis*) (Endangered), Robinson's rain scarab beetle (*Phobetus robinsoni*) (Threatened), Andrews' dune scarab beetle (*Pseudocotalpa andrewsi*) (Threatened), and Giuliani's dune scarab beetle (*Pseudocotalpa giulianii*) (Threatened). Final rulemakings were completed for two of the species included in this proposal. The Delta green ground beetle (*Elaphrus viridis*) and the Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) were determined to be Threatened species, with Critical Habitat, on August 8, 1980 (45 FR 52803–10). This notice constitutes the withdrawal of the proposals to list the eight beetle species for which final rulemakings were not completed within the 2-year period following the date of proposal.

FOR FURTHER INFORMATION CONTACT: Mr. John L. Spinks, Jr., Chief, Office of Endangered Species, Fish and Wildlife Service, Washington, D.C. 20240 (703/235–2771).

SUPPLEMENTARY INFORMATION:

Background

Section 4(f)(5) of the Endangered Species Act of 1973, as amended, November 10, 1978, stated that:

> A final regulation adding a species to any list published pursuant to subsection (c) shall be published in the **Federal Register** not later than two years the date of publicaton of the notice of the regulation proposing listing under paragraph (B)(i)(I). If a final regulation is not adopted within such two year period, the Secretary shall withdraw the proposed regulation and shall publish notice of such withdrawal in the **Federal Register** not later than 30 days after the end of such period. The Secretary shall not propose a regulation adding to such a list any species for which a proposed regulation has been withdrawn under this paragraph unless he determines that sufficient new information is available to warrant the proposal of a regulation. No proposed regulation for the listing of any species published before the date of the Endangered Species Act Amendments of 1978 shall be withdrawn under this paragraph before the end of the one-year period beginning on such date of enactment.

The 2-year time limit on proposals and 1-year period on suspension of withdrawals which were established in this subsection have expired for Beller's ground beetle, the Sacramento anthicid beetle, globose dune beetle, San Joaquin dune beetle, Mojave rabbitbrush longhorn beetle, Robinson's rain scarab beetle, Andrew's dune scarab beetle, and Giuliani's dune scarab beetle. In accord with section 4(f)(5), these species were withdrawn on August 10, 1980. This action gives notice of this withdrawal.

This notice is issued under the authority contained in the Endangered Species Act of 1973, as amended (16 U.S.C. 1531–1543).

The primary author of this notice is Dr. Michael M. Bentzien, Office of Endangered Species, U.S. Fish and Wildlife Service, Washington, D.C. 20240 (703/235–1975).

Dated: September 25, 1980.

Ronald E. Lambertson,

Acting Director, Fish and Wildlife Service.

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Part IV

Department of Energy

Southeastern Power Administration

Final Power Marketing Policy for Georgia-Alabama System of Projects

DEPARTMENT OF ENERGY

Southeastern Power Administration

Power Marketing Policy, Georgia-Alabama System of Projects

AGENCY: Department of Energy, Southeastern Power Administration (SEPA).

ACTION: Notice of issuance of Final Power Marketing Policy, Georgia-Alabama System of Projects.

SUMMARY: The Administrator has adopted the attached final power marketing policy for SEPA's Georgia-Alabama System of Projects. It will be effective upon publication in the **Federal Register** and will be applicable to the sale of system power in respective utility areas as then existing contracts, or necessary extensions, expire. The policy was developed in accordance with Procedure for Public Participation in the Formulation of Marketing Policy published in the **Federal Register** on July 6, 1978, 43 FR 29186.

Following a decision by the Administrator that a new written marketing policy for the Georgia-Alabama System of Projects was needed, a Notice of Intent to Formulate Power Marketing Policy was published in the **Federal Register** on February 16, 1979, 44 FR 10111. The Notice, among other things, solicited proposals and recommendations for consideration by SEPA. seventh-eight responses were received as a result of the Notice of Intent.

On October 16, 1979, a Proposed Power Marketing Policy for the Georgia-Alabama System of Projects was published in the **Federal Register**, 44 F.R. 59642, and the availability of a draft Environmental Assessment was announced and comments on both documents were solicited. thirty-five35 comments were received relative to the proposed policy itself, during public comment forums held in Atlanta, Georgia, and Columbia, South Carolina, on January 10 and January 24, 1980, respectively, or during the written comment period which ended February 19, 1980. No comments were received on the Environmental Assessment. Additionally eight consultations were held with representatives of interested entities or groups of entities.

On February 21, 1980, the Administrator appointed a Staff Committee to prepare a Staff Evaluation of all oral and written comments and responses received by SEPA. The Staff Evaluation was completed April 30, 1980.

Following the Staff Evaluation, the Administrator decided to modify in limited particulars the Proposed Power Marketing Policy published October 16, 1979, and to adopt the policy as modified.

SUPPLEMENTAL INFORMATION: The final marketing policy constitutes the guidelines which SEPA will follow in the future disposition of power from the system. The policy covers power from the existing Allatoona, Buford, Carters, Clark Hill, Hartwell, Jones Bluff, Millers Ferry, Walter F. George and West Point Projects and the Richard B. Russell Project now under construction. The policy establishes the marketing area for system power and deals with the allocation of power among area customers. It also deals with the handling of energy at pumped storage installations and the utilization of area utility systems for esstential purposes. The policy also deals with wholesale rates, resale rates and conservation measures.

Based on the Environmental Assessment of the proposed marketing policy, SEPA and DOE concluded that the proposed policy would not have a significant effect upon the quality of the human environment. The Final Marketing Policy is not modified sufficiently to alter this finding.

A recitation of the primary objections to the proposed marketing policy, brief explanations for rejecting those objections, and specific changes in the proposed marketing policy approved by the Administrator, precede the text of the final policy as adopted.

Issued at Elberton, Georgia, September 25, 1980.

Harry F. Wright,
Administrator.

Final Power Marketing Policy, Georgia-Alabama System of Projects

Introduction. The final marketing policy for SEPA's Georgia-Alabama System of Projects is the culmination of efforts which began on February 2, 1979. SEPA has followed the step by step requirements of its Procedure for Public Participation in Formulation of Marketing Policy published in the **Federal Register** on July 6, 1978, 43 F.R. 29186. Extensive public comment has been received and considered. This public input, offered in an orderly and timely fashion, has significantly contributed to the content of the final policy.

Purpose and Legal Authority. The purpose of the policy is to establish with public input written guidelines which SEPA will follow in the future to reasonably and equitably carry out the statutory requirements contained in Section 5 of the Flood Control Act of 1944, 16 U.S.C. 825s. SEPA's authority to formulate the policy and perform these functions is derived from Section 302(a) of the Department of Energy Organization Act, 42, U.S.C. 7152, and delegations pursuant thereto.

Reasons for Marketing Policy. Since its establishment in 1950, SEPA has utilized an ad hoc approach to power marketing. Resulting policy has been reflected in negotiated contractual documents. However, sometime before passage of the DOE Organization Act, SEPA recognized the need for more formal power marketing policy. Factors contributing to this need were major changes within the electric power industry, the steep rise in energy prices and the growing and increasing widespread interest in SEPA's limited resources. Additionally, contracts for portions of the power from the system were expiring and both existing and potential customers needed to know what SEPA planned to do with system power so that orderly power supply plans could be made. Furthermore, advice had been given that SEPA would reconsider certain entities interests in SEPA power expiration of contracts and availability of additional sources of power.

Primary Objections and Responses. A number of objections (or suggestions for change) were filed to the Proposed Power Marketing Policy as published in the **Federal Register** on October 16, 1979, 44 F.R. 59642. SEPA responses to the objection or suggestions follow:

1. *Objection.* Rather than maintaining four separate systems, SEPA should integrate its projects into one system with a marketing area covering the 10-state area (exclusive of the TVA service area) in which SEPA is authorized to market power. It is contended that (1) additional capacity and firm energy would result for sale to preference customers, (2) all preference entities within the region (outside the TVA area) would be included in the SEPA marketing area and should be the recipient of an allocation of power and (3) a single marketing policy would suffice.

Response. At the outset of policy review, SEPA considered the possibility of combining its systems. The idea was found to be impractical, the concept unmanageable, and the approach unproductive. The task of hydraulically and electrically combining the widely separated systems would first of all have been Herculean in nature and impractical of achievement. Secondly, the possibility of increasing the dependable capacity available to SEPA through integration of the systems is theoretically very limited inasmuch as the dependable capacity of the respective systems is already (in the case of the Georgia-Alabama, Kerr-Philpott and Jim Woodruff systems) or predicted (in the case of the Cumberland System) to be very substantiallly in excess of the nameplate rating of the machines and already very near the machine limits which the Corps of Engineers will allow for sustained generation. Thirdly, SEPA's existing resources represent only about 3 percent of the region's capacity requirements and 1.5 percent of its energy requirements, and of the region's preference entity requirements only about 8 percent and 5 percent, respectively. To attempt to spread the limited resources so thinly would exceed the bounds of practicality and would constitute unsound business principles. And, with only limited additional resources available in the foreseeable future, the precentages of preference load which SEPA could serve could only get smaller and smaller.

Additionally, there exist marketing problems in the respective system areas which are not common to all system areas, mitigating against a single marketing policy.

Finally, since SEPA has rejected the single system concept and adopted a four system approach, it is neither necessary nor appropriate to here respond to the contention that TVA and its service area and preference customers outside the 10-state area now served by SEPA should be eliminated from SEPA's marketing program. Rather, these matters shall be appropriately addressed in the development of policy for other systems.

2. *Objection.* The proposed policy is objected to in that it does not provide the most value to preference customers, the southeastern region of the United States, and affected utility service areas while achieving the goals of (1) conservation, (2) reducing the nation's dependence upon oil imports, and (3) fostering power pooling.

Response. The policy's goal is to sell all available power to preference entities in a widespread geographic area and to as many preference entities within such area as choose to purchase SEPA power consistent with the other marketing principles set forth in Section 5 of the Flood Control Act of 1944, taking into account SEPA's relatively limited resources. SEPA's projects are located in areas of predominantly coal-fired generation. The suggestion that the power should be marketed in utility areas utilizing predominantly oil-fired generation is impractical for a number of reasons, including: (1) these oil burning utility areas, located in Western Mississippi, Peninsular Flordia, Virginia and northeastern North Carolina, are up to 600 miles distant from the Georgia-Alabama System of Projects and are several utilities removed from the source of power, (2) the movement of the power through the multiple systems would involve transmission losses and costs which would cause apparent additional savings to dissipate, and (3) the projects operating efficiency would be adversely affected in that they were not planned to be dispatched against those area loads. The inherent idea that SEPA's power could and should be considered a floating ingredient in the southeast region being moved at a given time to utility areas having highest costs is incongruous with the principles under which SEPA operates and is grossly impractical.

SEPA power available from the Georgia-Alabama System is primarily peaking power. The projects providing this power were authorized, planned, constructed, and are available for marketing under the concept that the overall value of the power produced derived principally from the capacity component of the power by saving the cost of construction of other power sources in the area. While the energy component contributes to overall project values, it contributes less than the capacity component.

Furthermore, the capacity values are dependent upon the elimination of construction of other power units, and these values are fully realized only when area power planning takes into account the available hydrocapacity and provides for construction of other generation on this basis. Capacity shifted from one area to another can have very little value in the new area for a period of years.

Concerning conservation, hydro projects produce electrical energy from streamflows which are otherwise wasted. The energy must, within defined limits, be generated when available and is most efficiently used with other types of generating resources. While the flexibility of hydro generation contributes in numerous ways to the efficient operation of a system of which it is a part, including at times, the saving of oil, its very nature requires that it be timely exploited and conservation measures should be directed toward reducing the installation and operation of other types of generation.

As to power pooling, SEPA's minority position in the region's power production, plus its non-ownership of transmission facilities, restricts its ability to promote power pooling. SEPA's opportunities lie in taking advantage of such power pooling as may exist in the furtherance of its program.

3. *Objection.* Contrary to the proposed policy, all preference entities throughout the southeast region should receive an allocation of SEPA power and preference entities not now served by SEPA should be treated the same as existing preference customers, except for perhaps a changeover period, during which time presently unserved entities should receive all new capacity and energy which becomes available. The only exceptions to the equal treatment policy should be in those few circumstances where existing preference customers can show a strong reliance on the power or equitable considerations.

Response. This approach to SEPA policy making would have a radical impact upon existing customers and SEPA's marketing program. There are approximately 570 public bodies and cooperatives in the 10 southeastern states. They had combined 1978 loads in excess of 36,000 megawatts and 156 million megawatt-hours. In 1978 (and today), SEPA serves about 190 preference customers. SEPA's 1978 resources of 2,712 megawatts of nameplate capacity and approximately 7 billion kilowatt-hours of average annual energy would have equated to only about 8 percent of the capacity requirements and less than 5 percent of the energy requirements of preference entities in the 10-state region. By 1985, even with the addition of the Richard B. Russell Project and the fifth unit at Hartwell (the only new power available during policy period), SEPA's projected resources of approximately 3,092 megawatts of nameplate capacity and 7.5 billion kilowatt-hours of average annual energy will serve only a declining percentage of preference customer requirements. SEPA's resources are simply too limited in relation to requirements to embark upon such a proposal.

Since the initial establishment of a marketing area for the fledgling Georgia-Alabama System in the mid-fifties, SEPA has progressively enlarged its marketing area and increased the number of preference customers served. Once a seller-preference customer relationship was established, SEPA has never unilaterally terminated such a relationship. Nor has SEPA ever reduced a regular preference customer's allocation once established. It has brought all of the projects in the Savannah, Apalachicola and Alabama-Coosa River Basins into a system and has pushed the boundaries of the marketing area as far from the projects as the amount of power available would warrant when considered in relationship to customer demand and other practical and relevant factors. SEPA has sought to include all eligible preference entities within the selected marketing area with an equitable distribution of whatever new power was available for sale at a given point in time. In SEPA's judgment, the final policy deals equitably with existing and potential customers with respect to both presently available and new power.

As to the contention that only a few specified preference customers have compelling arguments to retain existing allocations, SEPA doubts that any one existing customer could make an argument more compelling than any of the others.

One course of action for preference entities located remote from existing Federal projects, if they desire the Federal Government as a source of power supply, would be to seek the authorization and construction of projects favorably located.

4. *Objection.* SEPA's proposed policy failed to provide for the allocation of capacity, without energy, for those preference customers desiring such an allocation.

Response. In the past, for a number of reasons, it was not possible to develop arrangements whereby preference customers could physically and economically utilize all of SEPA's peaking capacity, resulting in the sale of a portion of the capacity without energy to some of the private utilities. Because of changed or changing circumstances in the power industry, SEPA's proposed policy set the goal of selling all available SEPA power to preference entities. The idea of selling capacity without energy was not considered practical when the proposed policy was issued and remains untested. SEPA is not adverse to exploring the feasibility of the concept where equitable distribution of available power to preference customers warrants. However, since it is possible to achieve an equitable and desirable distribution of available power on a reasonably timely basis within the Georgia-Alabama System marketing area without further consideration of the concept the final policy for this system does not embrace it.

5. *Objection.* It is improper not to include the complete Duke Power Company service area within the Georgia-Alabama System marketing area.

Response. Basically the marketing area selected by SEPA is within 150 miles of the projects, the only relaxation being to include one customer in Mississippi, one in Georgia and three in South Carolina. And, all of these are presently customers of SEPA. To extend SEPA's marketing area throughout the Duke service area would require an extension beyond the selected 150 miles from the Savannah River Projects of approximately another 100 miles. Within this additional area are delivery points of eleven preference entities, eight cooperatives and three municipalities, having combined loads in 1978 of approximately 500 megawatts. To extend the radius circles here another 100 miles would make plausible requests to likewise extend the circles up to 250 miles to include a portion of the CP&L area in North Carolina, and to include western Mississippi and a portion of Florida not now included. This would be followed by the argument that these partially served utility areas should be completely served. Indeed, as hereinafter considered, preference entities in all of these utility areas advocate their respective inclusion in SEPA's Georgia-Alabama marketing area. SEPA's limited resources do not justify such vast extensions. The selected marketing area covers 152,000 square miles and contains some 204 eligible preference entities.

6. *Objection.* It is improper to exclude the unserved portions of Western Mississippi, Peninsular Florida and North Carolina and Virginia from the marketing area.

Response. As stated in previous responses, preference customer demand far exceeds the amount of power SEPA has for sale. A selective process is accordingly, necessary. The total 1978 preference load within the selected marketing area approximated 7,400 megawatts and 31,130 megawatt-hours. SEPA's installed generation in 1978 in its Georgia-Alabama System totaled 1,550 megawatts with an estimated 3,223 megawatt-hours of average annual energy. Additional generation under construction is limited. In SEPA's opinion no area listed in the objection is more or less favorably situated than any other. In SEPA's judgment there is no basis for treating any one of the named areas differently from any other. Located in the unserved areas listed in the objection are preference entities which had 1978 loads of approximately 8,100 megawatts and 34,800 megawatt-hours. It is no simple matter to obtain satisfactory wheeling and marketing arrangements and the difficulty increases with distance from power sources and the number of intervening transmission utilities. Reasonable justification for spreading the limited power so thinly does not exist. Furthermore, these areas are beyond the reasonable orbit of the power.

7. *Objection.* The preference entities in the South Carolina Electric & Gas Company service area should be given allocations from new sources so as to give them equality with existing customers in the eastern portion of the marketing area.

Response. It is contended that these customers were not previously offered SEPA power and should therefore be distinguished from those preference entities in the Duke area who previously refused SEPA power. While this argument has some merit and perhaps could have been an important factor in determining an allocation to these customers under the initially proposed policy, the treatment of new customers under the finally adopted policy provides equity where all new customers—whether located in the Duke or South Carolina Electric & Gas Company service area—are treated in the same way. Under the finally adopted policy, the new customers located in the South Carolina Electric & Gas service area will be allowed to share in existing Hartwell Project power now purchased by Duke Power Company in addition to power available from the 5th Hartwell unit and Russell Project power.

8. *Objection.* SEPA's proposed policy fails to take into account anti-competitive effects of treating cooperative preference entities differently from municipal preference entities.

Response. There is no resulting difference in treatment of cooperatives and public bodies (individually or as a class) in any utility service area within SEPA's proposed marketing area except in the Duke Power Company service area. The different treatment arises from the fact that a number of municipalities in the Duke area elected not to purchase SEPA power previoulsy offered them from the Hartwell and Clark Hill Projects. It is proposed that preference entities not now served in the marketing area share equitably in any new power with existing customers.

Furthermore, SEPA does not believe there is perceptible class competition in the Duke area between cooperatives and municipalities. While there may be limited individual cooperative-municipal competition, the relatively small percentage of SEPA power which goes to its customers would not constitute such an advantage as to be the determining factor in attracting customers to particular systems.

9. *Objection.* Preference customers lack assurance that they can make meaningful and timely input into SEPA negotiations with wheeling agents.

Response. SEPA's proposed policy provides for such input. The concern is that vital decisions by SEPA might be made before preference customers are actually involved, foreclosing proper consideration of preference customer positions. To make SEPA's intent clear that the timely, effective input of preference customer is desired, the final policy has been revised to insure that preference representatives are identified at the outset and are afforded the opportunity throughout negotiations to consult with and offer advice to SEPA.

10. *Objection.* SEPA should not impose a mandatory conservation program on preference entities as a condition for doing business with SEPA or for other reasons.

Response. Conservation of electricity by all ultimate consumers is an important national goal. There is no overt opposition to the concept of conservation. However, there is strong objection from preference entities to SEPA imposing specific conservation requirements as a prerequisite to a power contract with SEPA. At this point, SEPA plans to provide its customers with technical assistance where needed to develop and implement energy conservation programs and the policy provides that customers will agree to finance and take reasonable measures to encourage the conservation of energy by ultimate consumers.

Changes in Proposed Marketing Policy

The final policy reflects the following changes in the proposed policy published October 16, 1979:

The introductory section (*General*) has been revised to make the final policy effective upon publication in the **Federal Register**, and established its applicability to the sale of power in respective utility areas as then existing contracts, or necessary extensions, expire.

The substance of the *Allocations of Power* section has been revised so that existing preference customers within the selected marketing area will be allowed to retain present allocations of both capacity and energy and to allow new preference customers in the eastern portion of the marketing area commencing with the combined availability of power from the 5th Hartwell unit and the Russell Project to equitably share with existing customers in that power and with existing customers on the Duke system in capacity presently sold to Duke Power Company. Prior thereto the policy provides for the latter capacity to be sold to existing preference customers served from the Duke system. The policy also provides that iterim sales of power will be in the discretion of the Administrator.

Finally, the last sentence of the section labeled *Utilization of Utility Systems* is revised to insure that representatives of directly affected preference customers will from the outset of negotiations with wheeling entities be allowed to consult with and offer advice to SEPA.

Final Power Marketing Policy, Georgia-Alabama Projects

General. The projects and power subject to this policy are:

Projects	Capacity (kW) (name-plate)	Energy (MWH) (average annual)
Allatoona	74,000	157,000
Buford	86,000	196,000
Carters	500,000	[1] 201,000
Clark Hill	280,000	751,000
Hartwell	[2] 344,000	493,000
Jones Bluff	68,000	352,000
Millers Ferry	75,000	409,000
Walter F. George	130,000	451,000
West Point	73,375	213,000
Richard B. Russell [3]	300,000	464,000

[1] Does not include energy from pumping operation.
[2] Includes 80,000 kW 5th unit, availability scheduled 1983.
[3] Does not include pumping units; conventional units availability scheduled 1984.

There will be one policy for the Georgia-Alabama System of Projects progressively implemented. It will become effective upon publication in the **Federal Register** and will be applicable to the sale of system power in respective utility areas as then existing contracts, or necessary extensions, expire. The sale of power in the South Carolina Electric & Gas Company service area (wherein SEPA does not presently sell power) will commence with the combined availability of power from the 5th Hartwell unit and the Russell Project.

The policy will be implemented through negotiated contracts for terms not to exceed 10 years.

Transmission facilities owned by utilities within the marketing area will be used for all necessary purposes including transmitting power to load centers. Deliveries may be made at the projects, at utilities interconnections or at customer substations, as determined by SEPA. The projects will be hydraulically, electrically and financially integrated and will be operated to make maximum contribution to the power supply of the selected utility areas. Preference in the sale of the power shall be given to public bodies and cooperatives.

Marketing Area. The marketing area shall consist of two parts, with the Savannah River being the dividing line. The portion west of the river shall consist of the approximate 112,000 square mile area generally known as the service areas of the Georgia, Alabama, Mississippi and Gulf Power Companies or the Southern Company service area. The portion east of the river shall consist of the approximate 40,000 square mile area generally known as the service areas of the South Carolina Public Service Authority and the South Carolina Electric and Gas Company plus that portion of the Duke Power Company's service area within a radius of 150 miles of the Clark Hill, Hartwell and Russell projects. The 204 eligible public bodies and cooperatives which now exist within the 152,000 square mile area are listed in Appendix A attached hereto.

Allocations of Power. Approximately one-half of the output of each of the projects, Clark Hill, Hartwell and Russell will be allocated on a long-term basis to customers located in the eastern portion of the maketing area. The Remainder of system power will be allocated on a long-term basis to customers in the western portion of the area. Power from the 5th Hartwell unit and the Russel Project will be considered on a combined basis for long-term marketing. Except where duplication of allocation would result, each public body and cooperative within the marketing area as shown on Appendix A will be entitled to an allocation of power.

Existing preference customers within the marketing area will be entitled to retain their present allocations of capacity and energy. It is SEPA's goal to allocate all available and usable system power to preference customers including the capacity presently being sold to Duke, Georgia, Alabama, Mississippi and Gulf Power Companies, provided viable and acceptable marketing arrangements can be secured.

Accordingly, all existing capacity presently allocated to the western portion of the marketing area and presently under contract to private utilities will be allocated to existing distribution preference customers of SEPA (there being no new customers) to the maximum extent feasible and practical, in proportion to existing energy allocations. Energy from the 5th Hartwell unit and the Russell Project (combined) allocated to the western portion of the area will be allocated to preference customers (including the two G and T cooperatives) on the basis of loads, and, to maintain common load factors for all distribution preference customers, capacity from these new sources will be allocated to such distribution customers based on their respective energy allocations from SEPA.

Subsequent to the availability of power from the 5th Hartwell unit and the Russell Project, new preference customers located in the SEPA portion of the Duke Power Company service area and in the South Carolina Electric & Gas Company service area will be entitled to share equitably based on loads with existing preference customers (in the Duke area) in capacity presently being sold to Duke Power Company; and, all customers, both existing and new, in the eastern portion of the marketing area will be entitled to share equitably based on loads in energy from the 5th Hartwell unit and the Russell Project. To maintain common load factors for new customers as a class, existing customers served from the Duke system as a class and existing distribution customers on the SCPSA system as a class, capacity from respective sources will be allocated based on energy allocations from SEPA.

Prior to the availability of power from the 5th Hartwell unit and the Russell Project (1) all existing capacity delivered to the Duke system will be allocated to existing preference customers served from that system to the maximum extent feasible and practical, in proportion to existing energy allocations and (2) existing allocations of capacity and energy to preference customers in the South Carolina Public Service Authority area will be continued.

Interim sales of power will be in the discretion of the Administrator.

Energy from Pumped Water. SEPA will utilize its combination pump-storage and generation resources to produce high-value peak energy through utilization of lower-value off-peak steam energy and may arrange for such pumping energy either through purchase or exchange agreement at its election. Should the purchase alternative be selected, SEPA will obtain pumping energy from utilities offering the best terms. Should the exchange alternative be selected, pump-storage operations will be handled with public bodies, cooperatives and the utilities in a manner not involving the direct purchase and sales approach, with preference given to public bodies and cooperatives. Should pump-storage units be installed at Russell Project during the tenure of contracts implementing this policy, SEPA will allocate two units to the western division of the marketing area and two to the eastern division, with the latter assigned one to the SCPSA and SCE&G areas and one to the Duke area.

Utilization of Utility Systems. In the absence of transmission facilities of its own, SEPA will use area generation and transmission systems to integrate the Government's projects, provide firming, wheeling, exchange and backup services and such other functions a may be necessary to dispose of system power under reasonable and acceptable marketing arrangements. Utility systems providing such services shall be entitled to adquate compensation. Specific terms and conditions of all such arrangements shall be the subject of negotiations between SEPA and the generation and transmission utilities providing the services. Individual preferred agencies directly affected by the negotiations shall through representatives selected at the outset of negotiations be kept currently advised as to the status and progress of negotiations and allowed to consult with and offer advice to SEPA.

Wholesale Rates. Rate schedules shall be drawn so as to recover all costs associated with producing and transmitting the power in accordance with then current repayment criteria. Production costs will be determined on a system basis and rate schedules will relate to the integrated output of the projects. Rate schedules may be revised periodically.

Resale Rates. Resale rate provisions requiring the benefits of SEPA power to be passed on to the ultimate consumer will be included in each SEPA customer contract which provides for SEPA to supply more than 25 percent of the customers total power requirements during the term of the contract.

Conservation Measures. Each customer purchasing SEPA power shall agree to finance and take reasonable measures to encourage the conservation of energy by ultimate consumers.

Appendix A—Preference Agencies in the Georgia-Alabama System Area

Distribution-Type Preference Agencies

Western Area

Alabama

Alexander City, Andalusia, Brundidge, Dothan, Elba, Evergreen, Fairhope, Foley, Hartford, LaFayette, Lanett, Luverne, Opelika, Opp, Piedmont, Robertsdale, Sylacauga, Troy, Tuskegee, Baldwin County EMC, Black Warrior EMC, Central Alabama EC, Clarke-Washington EMC, Coosa Valley EC, Covington EC, Dixie EC, Pea River EC, Pioneer EC, South Alabama EC, Southern Pine EC, Tallapoosa River EC, Tombigbee EC, Wiregrass EC.

Florida

Choctawhatchee EC, Escambia River EC, Gulf Coast EC, West Florida ECA.

Georgia

Acworth, Adel, Albany, Barnesville, Blakely, Brinson, Buford, Cairo, Calhoun, Camilla, Cartersville, College Park, Commerce, Covington, Dalton, Doerun, Douglas, East Point, Elberton, Ellaville, Fairburn, Fitzgerald, Forsyth, Fort Valley, Grantville, Griffin, Hampton, Hogansville, Jackson, LaFayette, LaGrange, Lawrenceville, Mansfield, Marietta, Monroe, Monticello, Moultrie, Newnan, Norcross, Palmetto, Quitman, Sandersville, Sylvania, Sylvester, Thomaston, Thomasville, Washington, West Point, Whigham, Crisp County Power Comm., Altamaha EMC, Amicalola EMC, Canoochee EMC, Carroll EMC, Central Georgia EMC, Coastal EMC, Cobb EMC, Colquitt EMC, Coweta-Fayette EMC, Douglas County EMC, Excelsior EMC, Flint EMC, Grady County EMC, Habersham EMC, Hart County EMC, Irwin County EMC, Jackson EMC, Jefferson EMC, Lamar EMC, Little Ocmulgee EMC, Middle Georgia EMC, Mitchell EMC, Ocmulgee EMC, Oconee EMC, Okefenoke Rural EMC, Pataula EMC, Planters EMC, Rayle EMC, Satilla Rural EMC, Sawnee EMC, Slash Pine EMC, Snapping Shoals EMC, Sumter EMC, Three Notch EMC, Tri-County EMC, Troup County EMC, Upson County EMC, Walton EMC, Washington EMC.

Mississippi

Coast EPA, Dixie EPA, East Mississippi EPA, Pearl River Valley EPA, Singing River EPA, Southern Pine EPA.

Eastern Area

North Carolina

Bostic, Cherryville, Concord, Cornelius, Dallas, Drexel, Forest City, Gastonia, Granite Falls, Huntersville, Kings Mountain, Landis, Lincolnton, Maiden, Monroe, Morganton, Newton, Pineville, Shelby, Stateville, Blue Ridge EMC, Crescent EMC, Haywood EMC, Pee Dee EMC, Rutherford EMC, Union.

South Carolina

Abbeville, Bamberg, Clinton, Due West, Easley, Gaffney, Georgetown, Greenwood, Greer, Laurens, McCormick, Newberry, Orangeburg, Prosperity, Seneca, Rock Hill, Union, Westminster, Winnsboro, S.C. Public Service Auth.[1], Aiken EC, Berkeley EC, Black River EC, Blue Ridge EC, Broad River EC, Coastal EC, Edisto EC, Fairfield EC, Horry EC, Laurens EC, Little River EC, Lynches River EC, Marlboro EC, Mid-Carolina EC, Newberry EC, Palmetto EC, Pee Dee EC, Santee EC, Tri-County EC, York EC.

Publicly-Owned Wholesale Power Supply Agencies

Western Area

Alabama Electric Cooperative, Municipal Electric Authority of Georgia, Oglethorpe Power Corporation (Georgia), South Mississippi Electric Power Association.

Eastern Area

Central Electric Power Cooperative (S.C.), North Carolina Municipal Power Agency No. 1.

[FR Doc. 80-30513 Filed 9-30-80; 8:45 am]
BILLING CODE 6450-01-M

[1] Also operates generation and transmission facilities and serves at wholesale.

federal register

Wednesday
October 1, 1980

Part V

General Services Administration

Changes to Federal Travel Regulations

GENERAL SERVICES ADMINISTRATION

41 CFR Ch. 101

[FPMR Temp. Reg. A-11, Supp. 11]

Changes to Federal Travel Regulations

AGENCY: Transportation and Public Utilities Service, General Services Administration.

ACTION: Temporary regulation.

SUMMARY: This regulation amends the Federal Travel Regulations to (a) increase the per diem and actual subsistence expense allowances, (b) increase the mileage reimbursement rate for use of privately owned vehicles under certain circumstances, (c) delete those areas that no longer qualify as designated high rate geographical areas (HRGA's) because of a higher per diem rate, designate additional HRGA's, and increase the maximum daily actual subsistence expense rates and/or redefine the boundaries of certain existing HRGA's, and (d) increase the per diem allowance for travel aboard the Alaska Ferry System.

This regulation implements Pub. L. 96-346 which increased maximum travel allowances for Federal civilian employees.

DATES: Effective date: October 5, 1980.

Expiration date: July 1, 1981, unless superseded or canceled.

Comments due by: December 5, 1980.

ADDRESS: Comments should be addessed to: General Services Administration (TT), Washington, D.C. 20406.

FOR FURTHER INFORMATION CONTACT: Mrs. Phyllis Hickman, Federal Travel Management Division (202-275-0651).

SUPPLEMENTARY INFORMATION: Pub. L. 96-346, dated September 10, 1980, increases the statutory maximum travel allowances by amending subchapter 1 of chapter 57 of title 5 of the United States Code (5 U.S.C. 5701-5709). The results of the investigations submitted to the Congress on March 24, 1980, were implemented in FPMR Temporary Regulation A-11, Supplement 9, effective April 20, 1980, to the extent possible within statutory limitations imposed by the Travel Expense Amendments Act of 1975 (Pub. L. 94-22, May 19, 1975).

A more recent cost investigation has been conducted, and the results of the investigation as reported to the Congress are reflected in this supplement.

The General Services Administration (GSA) in submitting the results of its latest investigations to the Congress on September 26, 1980, indicated that the governing regulations would be amended within 30 days. Mr. Allan W. Beres, Commissioner, Transportation and Public Utilities Service, General Services Administration, has determined that in view of this commitment and the enactment of Pub. L. 96-346, it is impossible to comply with all the requirements of Executive Order 12044 of March 23, 1978. However, GSA has complied with the Executive order to the extent possible within the time limitations stated herein.

Various agencies recommended that the current per diem allowance applicable to en route boat travel of 6 hours or more outside the counterminous United States be increased, with respect to travel by the Alaska Ferry System. Based on these recommendations, the pertinent provisions are being amended accordingly.

(5 U.S.C. 5707. Sec. 205(c), 63 Stat. 390; 40 U.S.C. 486(c))

In 41 CFR Chapter 101, this temporary regulation is listed in the appendix at the end of Subchapter A.

Federal Property Management Regulations Temporary Regulation A-11—Supplement 11

September 26, 1980.

To: Heads of Federal agencies.

Subject: Changes to Federal Travel Regulations.

1. *Purpose.* This supplement further amends FPMR 101-7, Federal Travel Regulations (FTR), as amended by FPMR Temporary Regulation A-11 and supplements 4, 8, 9, and 10 thereto, to (a) provide for increases in the mileage allowances for privately owned vehicles, (b) increase the per diem and actual subsistence expenses allowances, (c) revise the high rate geographical areas (HRGA's) listing, (d) increase the per diem allowance for travel by the Alaska Ferry System, and (e) extend the expiration date of FPMR Temporary Regulation A-11 and Supplements 4, 8, and 9 thereto.

2. *Effective date.* The provisions of attachment A to this supplement are effective for travel performed on or after October 5, 1980.

3. *Expiration date.* This regulation expires on July 1, 1981, unless superseded or canceled.

4. *Background.*

a. Pub. L. 96-346, approved September 10, 1980, increases the statutory maximum rates for per diem, actual subsistence expenses, and mileage allowances by amending subchapter 1 of chapter 57 of title 5 of the United States Code (5 U.S.C. 5701-5709).

b. The Travel Expense Amendments Act of 1975 (Pub. L. 94-22, May 19, 1975) authorizes the Administrator of General Services to issue regulations prescribing, within statutory limits, mileage allowance rates as well as the maximum reimbursement for actual subsistence expense travel in designated high rate geographical areas (HRGA's). With regard to the exercise of this authority, GSA is required to periodically investigate the cost of travel and the cost of operating privately owned vehicles to employees while on official travel and report the results of these investigations to the Congress.

c. The results of investigations submitted to the Congress on March 24, 1980, were implemented in FPMR Temporary Regulation A-11, Supplement 9, effective April 20, 1980, to the extent possible within statutory limitations imposed by Pub. L. 94-22. A more recent cost investigation has been conducted. The results of this investigation as reported to the Congress on September 26, 1980, are implemented in this supplement within the new statutory maximum rates authorized by Pub. L. 96-346.

d. Various agencies recommended that the current per diem allowance applicable to en route boat travel of 6 hours or more outside the conterminous United States be increase, with respect to travel by the Alaska Ferry System. Based on these recommendations, the pertinent provisions are being amended accordingly.

e. The law (5 U.S.C. 5704(a)) provides that when an employee who is engaged on official business for the Government chooses to use a privately owned vehicle in lieu of a Government vehicle, payment on a mileage basis is limited to the cost of travel by a Government vehicle. The regulation existing prior to the effective date of this supplement provided that the mileage rate for use of a privately owned vehicle in lieu of a Government-furnished automobile is based on the average rental rates which agencies pay for GSA motor pool automobiles and the administrative cost to the user agency. However, GSA has determined that the administrative cost to the user agency should not be considered a factor in determining the cost of travel by a Government vehicle. Pertinent provisions of the Federal Travel Regulations are being changed accordingly. Agencies may submit comments on this change.

5. *Explanation of changes.* The provisions of attachment A to this supplement amend the FTR, as amended by FPMR Temporary Regulation A-11 and supplements thereto, for the reasons given below.

a. Paragraph 1–4.2a is revised to increase the mileage allowances for use of privately owned conveyances when their use is advantageous to the Government; paragraph 1–4.2a–1(1) is revised to reflect the newly enacted statutory maximum mileage rates; and paragraphs 1–4.2c(1) and (2) are revised to reflect an increase in the mileage rate for the use of privately owned vehicles in certain circumstances.

b. Paragraph 1–4.4 is revised to increase the mileage allowance for use of a privately owned automobile when such use is in lieu of a Government-furnished automobile and to delete the administrative cost provisions.

c. Paragraph 1–7.2a is revised to increase the maximum per diem allowance for official travel within the conterminous United States.

d. Paragraph 1–7.3c(1) is revised to increase the uniform rate for the meals and miscellaneous subsistence expense allowance.

e. Paragraph 1–7.4b(3)(b) is revised to increase the per diem allowance for travel involving the Alaska Ferry System outside the conterminous United States.

f. Paragraphs 1–8.2a(2) and (3) are revised to increase the statutory maximum daily rates for actual subsistence expense travel involving unusual circumstances.

g. Paragraph 1–8.6 is revised to delete certain previously designated high rate geographical areas (HRGA's) which no longer qualify because of the new per diem rate and to increase the maximum daily actual subsistence expense rates and/or redefine the boundaries of certain existing HRGA's.

6. *Comments.* Comments concerning those provisions of this regulation (see par. 5b) pertaining to the average mileage cost for the use of a privately owned vehicle in lieu of a Government vehicle should be submitted to the General Services Administration (TT), Washington, D.C. 20406 within 60 days of the effective date for possible incorporation into the permanent regulations.

7. *Effect on other directives.* Supplements 4, 8, 9, 10, and 11 to FPMR Temporary Regulation A–11 contain all current amendments to the Federal Travel Regulations. (Supplement 11 contains the most current list of designated HRGA's.) The expiration date for FPMR Temporary Regulation A–11 and its Supplements 4, 8, and 9 is extended to July 1, 1981.

R. G. Freeman III,
Administrator of General Services.

Changes to the Federal Travel Regulations, FPMR 101-7 [1]

1. Paragraphs 1–4.2a, 1–4.2a–1, and 1–4.2c(1) and (2) are revised to read as follows:

1–4.2. *When use of a privately owned conveyance is advantageous to the Government.*

a. *Authorized mileage rates.* When the use of a privately owned conveyance is authorized or approved as advantageous to the government for the performance of official travel as provided in 1–2.2c(3), reimbursement to the traveler shall be at the mileage rates prescribed in (1) through (3), below.

(1) For use of a privately owned motorcycle: 20 cents per mile.

(2) For use of a privately owned automobile: 22.5 cents per mile.

(3) For use of a privately owned airplane: 45 cents per mile.

a–1. *Mileage rates outside the conterminous United States.* Generally, the mileage rates prescribed in a, above, are applicable outside as well as within the conterminous United States. However, if an agency determines that any mileage rate which is below the statutory maximum ((1), below) is inadequate compensation for use of a privately owned conveyance in a particular area outside the conterminous United States, the head of the agency may submit a request to GSA for the establishment of a higher rate for that area. Any new mileage rate approved by GSA for a particular area shall be the uniform rate payable to all Federal employees in that area. The request to establish a higher rate shall be forwarded to the General Services Administration (TTT), Washington, DC 20406, and shall include the following information:

(1) A recommended mileage rate not exceeding the following statutory maximums:

(a) For use of a privately owned motorcycle: 20 cents per mile;

(b) For use of a privately owned automobile: 25 cents per mile; and

(c) For use of a privately owned airplane: 45 cents per mile.

(2) An analysis of the costs per mile of operating the privately owned conveyance in the particular area involved shall include the data listed below. Expenses which are reimbursable as separate allowances under 1–4.1c, such as parking or toll fees, shall not be included as cost factors in this analysis.

(a) Size/type of conveyance to which the cost data apply.

(b) Fixed operating costs: Vehicle depreciation, insurance, taxes, and registration fees.

(c) Variable operating costs: Gasoline, motor oil, maintenance, repairs, and tires.

(d) Other related cost factors affecting vehicle operating costs which are peculiar to the area involved.

* * * * *

c. *To and from common carrier terminals and office.*

(1) *Round-trip when in lieu of taxicab to carrier terminals.* In lieu of the use of a taxicab under 1–2.3c, payment on a mileage basis at the rate of 22.5 cents per mile and other allowable costs as set forth in 1–4.1c shall be allowed for the round-trip mileage of a privately owned automobile used by an employee going from either the employee's home or place of business to a terminal or from a terminal to either the employee's home or place of business. However, the amount of reimbursement for the round trip shall not in either instance exceed the taxicab fare, including tip, allowable under 1–2.3c for a one-way trip between the applicable points.

(2) *Round-trip when in lieu of taxicab between residence and office on day of travel.* In lieu of the use of taxicab under 1–2.3d, payment on a mileage basis at the rate of 22.5 cents per mile and other allowable costs as set forth in 1–4.1c shall be allowed for round-trip mileage of a privately owned automobile used by an employee going from the employee's residence to the employee's place of business or returning from place of business to residence on a day travel is performed. However, the amount of reimbursement for the round trip shall not exceed the taxicab fare, including tip, allowable under 1–2.3d for a one-way trip between the points involved.

* * * * *

2. Paragraphs 1–4.4b, c, and d are revised to read as follows:

1–4.4. *When use of a privately owned conveyance is in lieu of a Government-furnished automobile.*

* * * * *

b. *Reimbursement based on Government costs.* Based upon average rental rates which agencies pay for GSA motor pool automobiles, it has been determined that the average mileage cost for use of a Government-furnished automobile for travel in the conterminous United States is 16.5 cents. Therefore, the mileage rate for authorized use of a privately owned conveyance when use of a Government-

[1] FPMR 101–7 is incorporated by reference at 41 CFR 101–7.003.

furnished automobile would be most advantageous to the Government shall be 16.5 cents. Exceptions to the above limitation may be authorized if an agency determines that, because of unusual circumstances, the cost of providing a Government-furnished automobile would be higher than 16.5 cents. In such instances the agency may allow reimbursement at such higher rate within the rate stated in paragraph 1–4.2a for advantageous use that will most nearly equal the cost of providing a Government-furnished automobile in those circumstances. In addition to mileage for the distance allowed under 1–4.1b, the employee may be reimbursed for expenses authorized under 1–4.1c which would have been incurred if a Government-furnished vehicle had been used.

c. *Partial reimbursement when Government automobile is available.* When an employee who is committed to using a Government-furnished automobile, or who because of the availability of Government-furnished automobiles, would not ordinarily be authorized to use a privately owned conveyance in lieu of a Government-furnished automobile nevertheless requests use of a privately owned conveyance, reimbursement may be authorized or approved. The rate of reimbursement shall be 7.5 cents per mile, which is the approximate cost of operating a Government-furnished automobile, fixed costs excluded.

d. *Reimbursement claims.* When claiming mileage at the 16.5 cent rate, the employee shall state on the voucher that a commitment was not made to use a Government-furnished automobile and that reimbursement for use of a privately owned automobile was not limited under 1–4.4c.

3. Paragraph 1–7.2a is revised as follows:

1–7.2. *Maximum locality rates.* * * *

a. *Conterminous United States.* Reimbursement for official travel within the conterminous United States shall be a daily rate not in excess of $50 except when actual subsistence expense travel is authorized or approved due to the unusual circumstances of the travel assignment or for travel to a designated high rate geographical area as provided in 1–8.1.

* * * * *

4. Paragraph 1–7.3c is amended by revising the introductory sentence in subparagraph c(1) to read as follows:

1–7.3. *Agency responsibility for authorizing individual rates.*

* * * * *

c. *When lodgings are required.*

(1) For travel in the conterminous United States when lodging away from the official duty station is required, the per diem rate shall be established on the basis of the average amount the traveler pays for lodging, plus an allowance of $23 for meals and miscellaneous subsistence expenses. Calculation shall be as follows:

* * * * *

5. Paragraph 1–7.4b(3)(b) is revised to read as follows: 1–7.4. *Rates en route outside the conterminous United States.*

* * * * *

b. * * *

(3) * * *

(b) When either of such rates prescribed herein is not commensurate with a traveler's subsistence expenses, a different rate may be authorized or approved not in excess of the maximum rate applicable to the destination duty point or, with respect to boat travel, not in excess of $9.00, except that the rate for travel by the Alaska Ferry System shall not exceed $16.00.

* * * * *

6. Paragraphs 1–8.2a(2) and (3) are revised to read as follows:

1–8.2. *Authorized reimbursement.*

a. * * *

(2) For travel within the conterminous United States involving unusual circumstances, the statutory maximum daily rate is $75. Agencies shall determine appropriate and necessary daily maximum rates not to exceed this amount.

(3) For travel outside the conterminous United States involving unusual circumstances, the statutory maximum daily rate is $33 per day plus the maximum per diem allowance officially established for the overseas locality in which the travel is performed. (See 1–7.2.) Agencies shall determine appropriate and necessary daily maximum rates not to exceed this limitation.

* * * * *

7. Paragraph 1–8.6 is revised to read as follows:

1–8.6. *Designated high-rate geographical areas (HRGA's).* Under the provisions of 1–8.1b and 1–8.2a(1), for temporary duty travel to or within the cities designated as high-rate geographical areas below, a traveler shall automatically be placed in an actual subsistence expense status and shall be reimbursed for the actual and necessary subsistence expenses incurred, not to exceed the maximum rate prescribed for the particular geographical area involved. (Note—These rates are not to be construed as per diem rates.)

Designated HRGA's[1, 2]	Prescribed maximum daily rates
Arizona: **Tucson (all locations within the corporate limits of Tuscon, including Davis Monthan AFB)	$61
California:	
**Fresno	57
**Los Angeles (all locations within Los Angeles, Orange, and Ventura Counties, including Edwards AFB)	70
**Sacramento (all locations within Sacramento County)	62
**San Diego (all locations within San Diego County)	70
**San Francisco/Oakland (all locations within San Francisco, Alameda, and Contra Costa Counties)	75
**San Jose (all locations within Santa Clara County)	64
**Santa Barbara (all locations within Santa Barbara County)	68
Colorado:	
**Denver (all locations within Denver, Adams, Arapahoe, and Jefferson Counties)	67
**Vail	69
Connecticut:	
**Hartford (all locations within Hartford County)	56
**New Haven	63
Delaware: **Wilmington	62
District of Columbia: **Washington, DC, area (all locations within the corporate limits of the District of Columbia; the cities of Alexandria, Falls Church, and Fairfax, and the counties of Arlington, Loudoun, and Fairfax in Virginia; and the counties of Montgomery and Prince Georges in Maryland) (See also Maryland and Virginia.)	75
Florida:	
**Miami (all locations within Dade, Broward, Palm Beach, and Monroe Counties)	64
**Tampa/St. Petersburg all locations within Hillsboro and Pinellas Counties)	62
Georgia: **Atlanta	56
Illinois: **Chicago (all locations within Lake and Cook Counties)	74
Indiana:	
**Ft. Wayne	62
**Indianapolis (all locations within the corporate limits of Indianapolis, including Fort Benjamin Harrison)	62
Kansas:	
**Kansas City (see also Kansas City, MO.)	68
**Wichita	59
Kentucky:	
**Lexington-Fayette (all locations within Lexington-Fayette Urban County)	58
**Louisville	59
Louisiana: **New Orleans (all locations within Jefferson, Orleans, Plaquemines, and St. Bernard Parishes)	75
Maryland:	
**Baltimore (all locations within Baltimore City and Baltimore County)	59
**Montgomery County (see also District of Columbia)	75
**Prince Georges County (see also District of Columbia)	75
Massacusetts:	
**Boston (all locations within the counties of Middlesex, Norfolk, and Suffolk)	66
**Springfield	58
**Worcester	58
Michigan:	
**Detroit (all locations within Wayne County)	75
** Kalamazoo	57
Minnesota ** Minneapolis/St. Paul (all locations within Anoka, Hennepin, and Ramsey Counties, including the Fort Snelling Military Reservation)	61
Missouri:	
**Kansas City (see also Kansas City, KS.)	68
**St. Louis (all locations within St. Louis and St. Charles Counties)	67
Nevada: ** Las Vegas (all locations within the corporate limits of Las Vegas, including Nellis AFB)	75
New Jersey:	
*Atlantic City (all locations within Atlantic County)	63

Designated HRGA's[1 2]	Prescribed maximum daily rates
**Eatontown (all locations within Monmouth County)	56
**Newark (all locations within Bergen, Essex, Hudson, Passaic, and Union Counties)	67
New Mexico: **Los Alamos	58
New York:	
**Lake Placid	56
**New York (all locations within the Boroughs of the Bronx, Brooklyn, Manhattan, Queens, and Staten Island and the counties of Nassau and Suffolk)	75
**Rochester	63
**Syracuse	59
Ohio:	
**Cleveland	71
**Toledo	59
Oregon: **Portland	56
Pennsylvania:	
*Coatsville	59
**Harrisburg	58
**Monroeville	64
**Philadelphia/Bala Cynwyd	75
**Pittsburgh	65
**Valley Forge/King of Prussia	58
Tennessee: **Memphis	61
Texas:	
**Dallas/Ft. Worth (all locations within Dallas and Tarrant Counties)	71
**El Paso	58
**Houston (all locations within the corporate limites of Houston, including the L. B. Johnson Space Center and Ellington AFB)	74
**San Antonio	61
Vermont: **Burlington (all locations within the corporate limits of Burlington, South Burlington, and Essex Junction)	56
Virginia (see also District of Columbia):	
**Alexandria	75
**Fairfax	75
**Falls Church	75
**Arlington County	75
**Fairfax County	75
**Loudoun County	75
Washington:	
**Seattle (all locations within King County)	72
**Spokane	60
West Virginia: **Charleston	59
Wisconsin: **Milwaukee	61
Wyoming: **Cheyenne	58

[1] HRGA's without a specific definition are defined as "all locations within the corporate limits or entirely surrounded by the boundaries thereof, including independent entities located within the boundaries" unless otherwise specified.

[2] HRGA's with county defintions shall include "all locations entirely surrounded by the boundaries thereof, including independent entities located within the boundaries."

*Newly designated HRGA.

**Increased maximum rate or redefined boundary for previously designated HRGA.

[FR Doc. 80-30519 Filed 9-30-80; 8:45 am]

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federal register

Wednesday
October 1, 1980

Part VI

Department of Energy

Defense Programs; List of Energy-Related Militarily Critical Technologies

DEPARTMENT OF ENERGY

Defense Programs; List of Energy Related Militarily Critical Technologies

AGENCY: Department of Energy.

ACTION: Notice of publication of a list of energy related militarily critical technologies.

SUMMARY: The Export Administration Act of 1979 (PL 96-72) requires under Section 5(d) that an initial version of a list of militarily critical technologies be published in an appropriate form in the **Federal Register** not later than October 1, 1980. The Secretary of Defense has primary responsibility for developing this list of militarily critical technologies. In support of the Department of Defense the Department of Energy has prepared a list of energy related militarily critical technologies. This list is attached.

DATES: Comments must be received on or before December 30, 1980.

ADDRESSEE: Written comments should be directed to Julio L. Torres, Director, Office of International Security Affairs, Room 5F-066, Forrestal Building, 1000 Independent Avenue, S.W., U.S. Department of Energy, Washington, D.C. 20585.

FOR FURTHER INFORMATION CONTACT:

John A. Griffin, Director, Division of Politico-Military Security Affairs, Office of International Security Affairs, Room 5F-066, Forrestal Building, 1000 Independent Avenue, S.W., U.S. Department of Energy, Washington, D.C. 20585 (202) 252-2127.

Leon Silverstrom, Assistant General Counsel for International Development and Defense Programs, Room 6F-055, Forrestal Building, 1000 Independence Avenue, S.W., U.S. Department of Energy, Washington, D.C. 20585 (202) 252-6975.

Dated at Washington, D.C. this 26th day of September, 1980.

Duane C. Sewell,

Assistant Secretary for Defense Programs.

DOE Critical Technology List

I. Introduction

This material was prepared in response to the Export Administration Act of 1979, which requires an interagency study, headed by the Department of Defense and with Department of Energy participation, of a proposed new approach to export control. The proposal suggests shifting the focus of control from end products to a set of critical technologies, in the hope that this shift of focus would provide a more effective system of controls and promote a broader range of exports without any increased risk to national security.

The attached list was developed in several iterations, with input from the National Laboratories and other selected DOE contractors. During this development a great deal of thought has been devoted to the problems of export control, and it is clear that substantially more work will have to be done to obtain a list that reflects all of the legitimate national security concerns, yet with enough specificity to be useful to export control officers.

Much of the background for the new approach to export control [1] appears to have come from the so-called "Bucy" report.[2] The new approach suggested in the Bucy report is incorporated in the Export Administration Act of 1979,[3] wherein the Secretary of Defense is directed to bear primary responsibility for developing a list of militarily critical technologies and the Secretary of Commerce is directed to maintain the list as part of the commodity control list.

Following the Bucy report's recommendations, the Export Administration Act of 1979 notes that primary emphasis shall be given to:

a. arrays of design and manufacturing know-how,
b. keystone manufacturing, inspection, and test equipment, and
c. goods accompanied by sophisticated operation, application, or maintenance know-how

that are not possessed by a country to which export is to be controlled and that, if exported, would permit a significant advance in a military system of the country.

It is essential in the development of a self-consistent list of critical technologies to devise practical definitions of the key terms, including "technology," "critical technology," and "keystone equipment." There are a number of definitions of these key terms devised and used by people seriously concerned about export control and technology transfer problems.[1-5] Examining and testing these definitions helps to give us the essential ideas that must be embodied in practical ones suited for our use.

Many of the definitions of "technology" appear to be aimed at production items, and perhaps production engineering know-how, and therefore do not seem applicable to research and development technologies for advanced or undeveloped concepts. Thus, according to such definitions, the US does not have a "fusion technology," or a "beam weapon technology" because we do not have the know-how to design let alone manufacture machinery or products to do those jobs. Yet, there are portions of the activities in these as well as other R&D programs that should be considered for export control.

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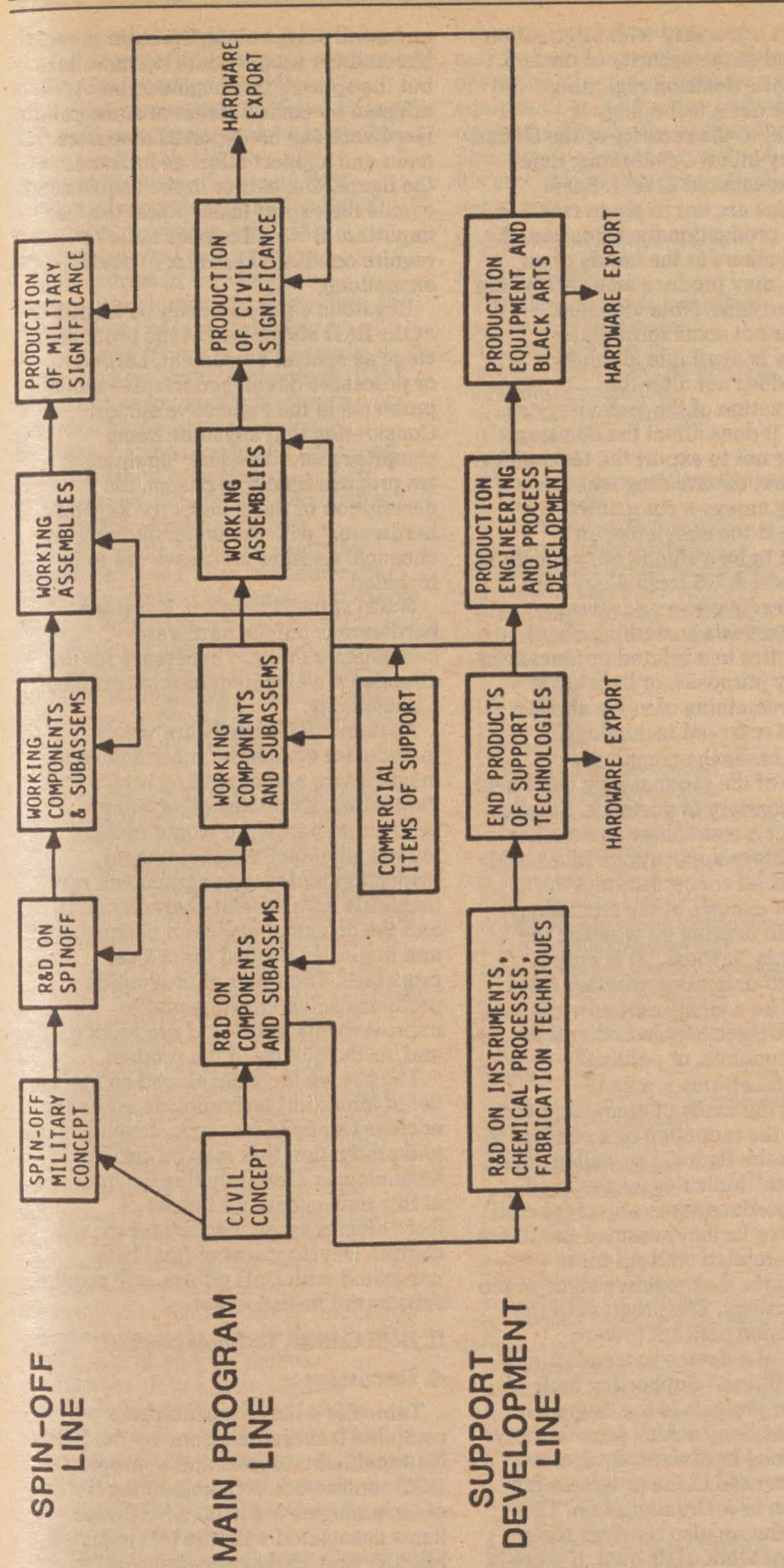

FIGURE 1

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A difficulty encountered in definitions of "critical technology" is that there is usually no time scale considered. Yet in deciding whether or not to license an export, a staff member must make some evaluation of the time it might take for the exported technology or hardware to appear as an adversary capability. In some cases the time may be so long that the capability would no longer be a threat. In other cases this may not be true. An ideal definition of critical technology would embody the condition that even after the time it takes for the adversary nation to absorb and apply the technology, it would still be considered critical. It seems especially important to keep in mind that some "high technology" R&D programs may require many years to yield a product, but the pay-off may be so great that it is wise to protect the relevant technology today. In the early stages of such a program, that is, before classification limits exchange, either side may benefit. Controlling exports or exchanges early in a development time scale therefore carries a risk.

In existing definitions of "keystone equipment" consideration of equipment required for advanced research and development activities is often overlooked. In such advanced studies, where problems of design are not yet solved, it is impossible to know what kind of equipment, materials, or components will be uniquely required for the manufacture of some final product. On the other hand, keystone equipment for the research and development phases can be identified.

In consideration of the difficulties of using definitions from other sources for selection of candidate hardware and ideas for export control, we propose the following ones for this study:

1. Technology. A specific technology is the body of knowledge acquired in the application of scientific principles to the solution of a specific technical problem.

Broader definitions of technology may be found, but are not appropriate in this report. Note that parts of the body of knowledge may be taken from other bodies of knowledge acquired previously, and parts may be acquired accidentally. The technical problem may be the construction of one magnetically confined fusion machine or the production of a large number of integrated circuits. It may also be an analysis of a new approach using existing hardware in a different way to solve the ABM problem. The quality of the end product depends upon the quality of the technology.

2. Critical Technology. A critical technology is a technology that would provide an adversary with information detrimental to the security of the U.S.

Note that a decision regarding whether or not a technology is detrimental to the security of the United Stated may involve evaluating time scales as discussed earlier. Some technologies are not likely to result in hardware production for a number of years, but others in the hands of an adversary may produce an effect within a very short time. Note also that whether or not some form of the technology is available in other countries does not alter the characterization of the technology as "critical." It does affect the decision whether or not to export the technology. Furthermore, determining whether a US technology enjoys a competitive advantage is too subjective an evaluation to be a significant concern in this analysis. A US technology may appear attractive to an adversary because it reveals something about vulnerabilities in a related product used for military purposes, or because it indicates something of value about a related but reserved technology.

In these cases the competitive advantage of the product may be at best of only secondary importance. Finally, the fact that a technology has civil as well as military applications (dual-use) creates special concerns about the licensing of exports of the technology, but it has no bearing on whether the technology is "critical." It is only important to determine whether there can or will be a significant adverse impact on US security, whether it be military, economic, or political.

Figure 1 illustrates a way to summarize the kinds of equipment that are part of the reduction of a concept to practice. In the figure, a so-called "main program line" indicates an assumed project to produce some object for civil use. We have further assumed that there is a closely related concept for a military device that requires some of the same technology. The progress of the defense related concept toward production of a device proceeds along the "spin-off line." Supporting both programs or projects is the "support development line," which provides any kind of special hardware, equipment, process, etc. used in the programs for construction or instrumentation. This special hardware also requires some development work of its own. If there is to be production at the ends of the lines, there is a production engineering or process development activity that culminates in the means for production. Possibilities for exporting the technology that characterizes this effort occur at any or all stages along the main program line and the support development line, but the spin-off line begins to be affected by classification at some point. Hardware can be exported also from the main and support effort as indicated in the figure. The earlier in the sequence of events the export takes place, the less important it would appear to be to require control. There are, of course, exceptions.

Keystone equipment can be identified at the R&D stages and at the production stage as special equipment, hardware, or processes developed to solve major problems in the respective stages. Considering that keystone items comprise more than just "equipment," we propose finally to change the description of these items to "keystone hardware," with the understanding that chemical or other processes are to be included.

3. Keystone Hardware. Keystone hardware is unique hardware components that are necessary for the effective development or application of a technology.

Keystone R&D hardware would include, for ecxample, superconducting magnet wire and exploding bridge wire detonators. Examples of keystone production hardware would include unique manufacturing equipment, inspection and testing equipment, raw materials with special characteristics, and the chemical engineering equipment and materials needed for critical processes. The types of production problems solved include major improvements in rates of production and/or the quality of the product.

The list we have developed so far is a list of important technologies related to nuclear weapons research, development, and production that may be critical technologies. Certainly this list does not at this time constitute the set of technologies recommended for export control. Development of final lists, integrated with DoD efforts, will require substantial further effort.

II. DOE Critical Technologies List

A. Discussion

Table I is a list of technologies compiled from submissions by the DOE National Laboratories and appropriate DOE contractors. Accompanying the list of technologies are lists of hardware items associated with the technologies. Military and civil applications of the technologies and foreign availability information complete the table.

All of the technologies overlap or impact in some way upon the technology of nuclear weaponry. They are all therefore "critical" to some degree. We believe that this list is best viewed as a starting point for more strict application of criteria important to controlling the export of US technology and hardware. In its present form, the table may be valuable in calling attention to areas of concern, but additional more detailed descriptive material is needed to help with decisions on real export cases.

Most entries in the "keystone hardware" columnn are themselves the end products of more primary technologies. There is, for example, a homopolar generator technology (II.B.), which has associated with it such keystone hardware as flywheels, bearings, brushes, magnetic coils, and others. It is not now clear to us how much to subdivide these technologies.

There are so many modern technologies that involve computer assistance in one way or another that we simply omitted reference to it except where it was particularly brought to our attention by someone in the business. A number of categories not so flagged in the table should have a "calculation technology" subheading and should have "computers" as keystone hardware.

In a collection of R&D technologies such as presented in Table I, the associated keystone hardware can seldom be classified as "associated end products," as the export act seems to call for. What we can list, however, are hardware items that are associated in some way with the technology. These items are either components of the main and spin-off development lines, or instrumentation of other support hardware that are crucial to the execution of these development lines. There is only an end product when the development program is successfully concluded. In a sense, then, the hardware items become more like indicators of the kind of work being carried out in the main program. Controlling the export of such equipment may force certain inconveniences or hardships on foreign scientists, even though the equipment itself is not directly of defense significance. It has been argued, however, that in the end, if foreign scientists are forced by export controls to invent their own support equipment, they will be more knowledgeable about the subjects than if they had been allowed to buy them.

In Table I, applications are sometimes listed for the entire main category, and if there are further applications for some of the keystone hardware items, they are listed additionally.

Finally, there are many "Black Arts" or tricks of the trade, which we cannot list as keystone hardware, but which may be just as essential to the proper operation of some process or piece of equipment as the hardware itself. These arts or tricks usually work in the direction to protect our technologies, so it's probably well to leave them unpursued.

B. Critical Technologies Table

1. Index to Table

I. Nuclear fuel cycle technology.
a. Uranium enrichment.
1. Gaseous diffusion.
a. UF_6 transport and purification.
b. Diffuser technology.
c. Calculation technology.
d. Reserved.
e. Reserved.
f. Feed/withdrawal technologies.
2. Gas centrifuge.
a. Rotor design technology.
b. Bearing design technology.
c. Suspension design technology.
d. Bellows mfg. technology.
e. Drive system mfg. technology.
f. Suspension system mfg. technology.
g. Reserved.
h. Reserved.
i. Reserved.
j. Reserved.
k. Reserved.
l. Flow system technology.
m. Auxiliary technologies.
n. Computer software technology.
3. Laser isotope separation.
a. Computer modeling technology.
b. Laser technology.
c. UF_6 handling technology.
d. Molten U handling technology.
e. Ion extraction technology.
f. Atomic vapor source technology.
g. UF_6 spectroscopy.
h. Atomic U spectroscopy.
i. Switching technology.
j. Reserved.
4. Plasma process.
a. Superconducting magnet technology.
b. U plasma technology.
5. Calutron technology.
a. Magnet technology.
b. Source technology.
6. Aerodynamic processes.
a. UF_6 flow technology.
b. Skimmer technology.
7. Chemical exchange.
a. Contactor technology.
b. Uranium compound handling technologies.
c. Recycle technology.
d. Materials handling technologies.
B. Reprocessing technology.
C. Heavy water production technology.
1. GS process technology.
2. Vacuum distillation technology.
3. D_2 O analytical technology.
D. Fuel fabrication.
1. Pellet fabrication technology.
2. Cladding technology.
3. Coated particle technology.
E. UF_6 production.
1. Uranium oxide hydrofluorination technology.
2. UF_4 fluorination technology
3. Uf_6 purification technology.
4. HF mfg. technology.
5. Fluorine mfg. technology.
F. Fission reactors.
1. Pressure vessel technology.
2. Cooling cycle technology.
3. Control technology.
4. Maintenance technology.
5. Safety technology.
G. Electro-nuclear breeders.
II. Fusion technology.
A. Very high power laser technology.
B. Charged particle accelerator technology.
C. Fusion pellet technology.
1. Pellet fabrication technology.
2. Computer software technology.
D. Magnetic confinement technology.
1. Superconducting magnet technology.
2. Switching technology.
3. Plasma technology.
4. Materials technology.
E. Imploding liner technology.
1. Computer software technology.
2. Switching technology.
3. Implosion system technology.
F. Impact fusion technology.
1. Impactor technology.
2. Computer software technology.
G. Diagnostics technology.
III. Reactor production of nuclear materials.
A. Tritium production technology.
B. Tritium handling technology.
C. Pu-239 production technology.
D. Pu-239 fabrication technology.
E. Pu-238 mfg. technology.
F. Reserved.
G. Reserved.
IV. Nuclear weapons technology.
A. Computer technology.
1. System mfg. technology.
2. Component mfg. technology.
3. Interactive graphics technology.
4. Operating systems technology.
B. R&D technology.
1. Computer calculations.
a. Laugauge technologies.
b. Code technologies.
2. Development testing technology.
3. Live nuclear test technology.
4. Componet fabrication technology.
C. Production technology.
D. Special component technologies.
E. Special materials technologies.
1. Fabrication technologies.
2. Purification technology.
3. Pyrotechnics fabrication technology.
4. Thermite composite fabrication technology.
5. Plasma polymerization technology.
6. Explosive recrystallization technology.
7. Large diameter high pressure storage vessel technology.
8. Paper honeycomb fabrication technology.
9. Silicone adhesive technology.
10. Nickel carbonyl [$Ni(CO_4)$] coating technology.
11. Thin film hydriding technology.
12. Electrical feedthrough technology.
V. MHD.
A. Superconducting magnet technology.
B. Materials technology.
C. Liquid metal handling technology.
D. Plasma studies.
VI. Advanced seismic detection.
A. Seismometer technology.
B. Signal processing technology.

C. Data and command transmission and reception technology.

VII. Satellite technology.

A. Detector technology.

B. Data transmission and reception technology.

VIII. Electronics.

A. Semiconductor mfg. technology.

IX. Safety, security, and survivability technology.

A. Reserved.

B. Encryption technology.

C. Electronically assisted physical security.

D. Weapon survivability.

X. Reserved.

DOE Critical Technologies

Critical technologies	Keystone hardware	Military applications	Civil applications	Foreign availability
I. Nuclear fuel cycle technology				
A. Uranium enrichment		Nuclear weapons, nuclear propulsion, space power reactors, portable power reactors.	Power reactors, research reactors	
1. Gaseous diffusion				UK, France, USSR, FRG, Netherlands, PRC, Sweden, Switzerland.
a. UF_6 transport and purification	UF_6-rated materials of construction.			
	Compressors			France, UK, FRG, USSR, PRC.
	Rotating shaft seals (inert gas buffered).		Seals for reactive gas systems, e.g., fluorine.	
	Valves for UF_6	Valves for reactive gas systems	Valves for reactive gas systems	Widely available.
	Heat exchangers for UF_6	Heat exchangers for e.g., fluorine	Heat exchangers for e.g., fluorine	France, UK, USSR, PRC.
	Cleaning solvents			
b. Diffuser technology	Barrier material, Diffuser housings, Nickel powder.	Battery plates, filters, alloys	Battery plates, filters, alloys	UK, Canada.
	Porous nickel metal			
	Barrier manufacturing equipment.			
c. Computer software technology	Computers	Many uses	Many uses	UK, France.
d. Reserved				
e. Reserved				
f. Feed/withdrawal technologies				
2. Gas centrifuge				USSR, UK, Netherlands, FRG, Japan, France, Pakistan, Australia, Italy, Switzerland, Sweden, Brazil.
a. Rotor design technology	Rotors			
b. Bearing design technology	Bearings			
c. Suspension design technology	Suspension systems			
d. Bellows mfg. technology	Bellows forming dies and mandrels.			UK, France, Japan, others.
	Hydraulic forming equipment (isostatic presses).	Many uses	Many uses	UK, FRG, USSR, France, Japan, others.
	Maraging steel			
e. Drive system mfg. technology	Synchronous motors (600–2000 Hz) High frequency steel.		Textile mills, high speed grinders	Widely available.
f. Suspension system mfg. technology	Magnets (metallic or ceramic dampers).		Loud speaker magnets	Widely available.
g. Reserved				
h. Reserved				
i. Reserved				
j. Reserved				
k. Reserved				
l. Flow system technologies	Valves, bellows sealed, nickel, monel or nickel plated.			UK Switzerland, FRG, France.
	Pressure transducers for UF_6		Chemical processing industry	FRG.
	Al alloy piping		Chemical processing industry	
	Process computers			France, FRG.
m. Auxiliary technologies	Vaccuum systems, Vacuum pumps.			FRG, others.
	Purge systems			USSR, UK, Netherlands, FRG.
	Balancing equipment			FRG.
	Leak detectors			UK, FRG.
	Mass spectrometers			UK, FRG.
	Inverters, converters, frequency changers and generators, 3-phase 600–2000 Hz.		Textile mills, high speed grinding equipment.	UK, FRG, Japan.
	Electrical power supplies			UK, FRG.
n. Computer software technology	Computers			
3. Laser isotope separation		Separation of fissile isotopes	Purifying materials, processing reactor wastes.	Canada, France, FRG, Japan, S. Africa, UK, USSR.
a. Computer modeling technology	Computers			
b. Laser technology		Laser guided weapons	Chemical analysis, photochemistry	USSR, France, Israel, FRG, Japan, others.
	Tunable diode lasers and amplifiers.			
	Tunable IR & UV lasers and amplifiers.			
	Tetrodes (>1 MW)			
	High efficiency high rep. rate copper lasers and amplifiers.			
	Electro-optical components			USSR, France, Israel, FRG, Japan, others.
	Excimer lasers and amplifiers			
	Tunable dye lasers and amplifiers.			

DOE Critical Technologies—Continued

Critical technologies	Keystone hardware	Military applications	Civil applications	Foreign availability
	Very high power dye lasers			
	Equipment for growing diode crystals.			
c. UF_6 handling technology				USSR, France, FRG, UK, Netherlands, Israel, Japan, S. Africa, Brazil.
	Supersonic nozzles UF_6 compatible materials of construction.			
d. Molten U handling technology				
	Crucibles			
e. Ion extraction technology				
f. Atomic vapor source technology				
	Electron beam heated vapor sources (high power strip sources).			
g. UF_6 spectroscopy	Tunable diode lasers UV spectroscopy.			
h. Atomic U spectroscopy				
	Tunable dye lasers			
i. Switching technology (~ 1000 pps, high current.				
	Power supplies			
	Thyratrons			
	Spark gaps			
	Low inductance capacitors			
j. reserved				
4. Plasma process a. Supercond. magnet technology.		MHD generators, magnetic flux sensors (ASW), supercond. propulsion systems.	MHD generators, Maglev transport, magnetic ore prospecting.	Japan, UK, FRG, France, USSR, Italy.
	Supecond. magnets			
	Magnet wire			
	Coils Cryogen handling equipment.			
	Winding and joining equipment.			
b. U plasma technology Materials of construction.	Magnets for large volume, uniform fields.			
	Plasma forming equipment			
5. Calutron technology				
a. Magnet technology Magnets for large uniform fields Regulated high current supplies.				
b. Source technology	Regulated high voltage supplies.			
6. Aerodynamic processes				FRG, S. Africa, Brazil, Sweden.
a. UF_6 flow technology				France, UK, USSR, FRG, PRC.
	Compressors for UF_6 UF_6-rated materials of construction.			
	Rotating shafe seals			
	Heat exchangers			
b. Skimmer technology				FRG, S. Africa, Brazil.
7. Chemical exchange				
a. Contactor technolgy	Contactors with low stage residence times (~ 20 s).	Plutonium and fission product separation.	Chemical process industries, waste treatment, many others.	France, Sweden, FRG, UK, Japan, many others.
	Contrifugal liquid-liquid contactors.			
	Pulse column liquid-liquid contactors.			
	Other multistage liquid-liquid contactors.			
b. Uranium compound handling technologies				UK, FRG, France, USSR, S. Africa, PRC, Japan, others.
	Materials of contruction			
	Fluoroplastics or fluoroplastic-lined pipe, valves, pumps, other equipment.		Many chemical processes	Many industrialized.
	Specialized uranium extractants	Fuel reprocessing-Pu recovery	Power reactor cycle, plastics, chloralkali, Chemical analysis.	Many industrialized countries.
	Electrolysis diaphragm materials.			
	Ion exchange resins (pellicular).			
c. Recycle technology	Cells for reduction by electrolysis (especially mercury cathode diaphragm cells).		Chloralkali industry	Many industrialized countries.
	Specialized multiple effect evaporators.		Chemical process industry	Many industrialled countries.
	Reverse osmosis systems which withstand high acid concentrations.			
d. Materials handling technologies	See designated (*) items udner "Reprocessing Technology".			B
. Reprocessing tehnology		Nuclear material production	Power reactor fuel cycle	Belgium, France, FRG, India, Italy, Japan, Taiwan, UK, USSR.
	Fuel shears			

DOE Critical Technologies—Continued

Critical technologies	Keystone hardware	Military applications	Civil applications	Foreign availability
	*Critically safe tanks			
	*Centrifugal contactors			
	*Mixer/settlers			
	*Pulse columns			
	Dissolution equipment			
	Tributyl phosphate			
	*HEPA filters			
	*Ion exchange mat'ls which will withstand intense radiation.			
	*Off-gas treatment systems			
	Manipulators for hot cells			
	Shielding windows for hot cells			
	*Process control instrumentation.			
	Radiation monitoring instrumentation modified for fuel reprocessing.			
	*Computers			
C. Heavy water production			Power reactors	Canada, France, USSR (?), Norway (?), India, Argentina.
1. GS process technology				
	Packed tower contactors		Chemical industry	Canada, India.
	Gas blowers for H_2S Water pumps.		Water purification	
	Heat exchangers			
	Condensers			
	Piping			
	Valves			
	Tanks			
	Storage vessels			
	Gas compressors			
	Process instrumentation			
	Water treatment equipment			
	Steam generating equipment			
2. Vacuum distillation technology			Chemical industry	
	Towers			
	Steam ejectors			
	Vacuum pumps			
	Water pumps		Water purification	
	Calandrias			
	Condensers			
	In process storage tanks			
3. D_2O analytical technology				
	Single beam infrared spectrophotometry.			
D. Fuel fabrication		Nuclear propulsion, nuclear materials production.	Power reactor fuel	France, USSR, Canada, FRG.
1. Pellet fabrication technology	Pellet presses			
	Sintering furnaces			
	Grinding and grading equipment.			
	Inspection equipment			
	Assay equipment			
2. Cladding technology				France, USSR, Canada, FRG.
	Welding equipment			
	Inspection equipment			
	Leak detection equipment			
	Tubing mfg. equipment			
	Hf-free zirconium			
	Zirconium casting vacuum furnaces.			
3. Coated particle technology	Spherical particle fabrication equipment Particle coating equipment.			
	Presses			
	Binder materials			
	Furnaces			
E. UF_6 Production		Feed for enrichment plant	Feed for enrichment plant	USSR, France, FRG, Belgium, UK, Japan, PRC, S. Africa, Italy, Canada.
1. Uranium oxide hydrofluorination technology (to produce UF_4).	Screw reactors		Chemical industry	
	Stirred fluid-bed reactors		Chemical industry	
	Fluid-bed reactors		Chemical industry	
	Inconel pipe		Chemical industry	UK, Canada.
2. UF_4 fluorination technology (to produce UF_6.	Flame towers		Chemical industry	Canada.
	Fluid beds		Chemical industry	
	Monel pipe		Chemical industry	UK, Canada.
3. UF_6 purification technology	Distillation columns			France.
	Absorption traps			
	Nickel-plated steel pipe			
	Bellows-sealed valves			UK, France, Switzerland.
4. HF manufacturing technology	Calcium fluoride		Chemical industry	
	Sulfuric acid			
		Chemical industry		

DOE Critical Technologies—Continued

Critical technologies	Keystone hardware	Military applications	Civil applications	Foreign availability
5. Fluorine mfg. technology	Fluorine cells	Rocket fuel	Fluorocarbon manufacture	UK, France.
	High density carbon anodes			
	Hydrofluoric acid (HF)			
	Potassium fluoride			
	Chlorine trifluoride			
F. Fission reactors		Propulsion, electric power	Electric power, process heat	Canada, USSR, FRG, France, Japan, UK, Belgium.
1. Pressure vessel technology	Very large rolling mill			
	Welding equipment			
	Inspection equipment (x-ray, sonic, etc.).			
	Very large forging machinery			
2. Cooling cycle technology	Pumps			
	Heat exchangers			
	Pressure, temperature, flowrate instrumentation.			
	Clean-up systems			
	Valves			
	Heavy water			
3. Control technology	Computers			
	Control rod drives			
	Monitoring instrumentation			
	Burnable poisons			
4. Maintenance technology	Fuel element handling equipment.			
	Inspection equipment			
5. Safety technology	Computers			
	Monitoring equipment			
	ECCS equipment			
	Inspection equipment and procedures.			
G. Electro-nuclear breeders			Electric power production	
	High current accelerators			
	Targets			
	Ion sources			
	Switching equipment			
II. Fusion technology		Nuclear mat'ls production, neutral beams, RF systems, effects simulation.	Electric power production	Canada, France, FRG, Italy, Japan, Poland, UK, USSR.
A. Very high power laser technology		Laser weapons, effects simulation	Welding	
	Very high power lasers			
	Very high power amplifiers			
	Mechanical and electro-optical hardware.			
	High voltage systems (pulse power).			
	High current high rep. rate switches with low jitter.			
	Pointing systems			
	Single point diamond cutting lathes.			
	Diamond tools			
	Optical coating equipment	Optical equipment	Telescopes	
	Optical polishing equipment for large optical elements.		Telescopes	
	Other ultrahigh precision equipment.			
	Gas handling equipment			
	NaCL windows			
	Glass components			
	Flash lamps			
	Electron beam pumping equipment.			
	Other pumping equipment			
B. Charged particle accelerator technology		Particle beam weapons, weapon physics simulation, neutron sources.	Physics research, medical research, x-ray machines.	USSR, France, PRC, others.
	Linear induction accelerators			
	Betatrons			
	Heavy ion accelerator modules			
	High energy density capacitors			
	Superconducting magnets			
	Homopolar generators			
	High rep. rate high current switches with low jitter.			
	Large thermionic cathodes			
	Pulsed alternators			
	Pointing systems			
	Computers			
	Ion sources			
	Electron sources			
	Vacuum system equipment			
C. Fusion pellet technology				
1. Pellet fabrication technology	Pellets			
	Pellet manufacturing equipment			

DOE Critical Technologies—Continued

Critical technologies	Keystone hardware	Military applications	Civil applications	Foreign availability
	Pellet loading equipment (D_2 gas handling, etc.).			
	Tritium handling equipment			
	Pellet sorting and inspection equipment.			
	Pellet manipulation equipment			
2. Computer software technology	Computers			
D. Magnetic confinement technology		MHD propulsion, MHD lasers, explosive MHD.	MAGLEV transportaion Explosive MHD.	Japan, FRG, UK, USSR, European community.
1. Superconducting magnet technology	See I.A.4.a.			
2. Switching technology	Power supplies			
	Energy storage components			
	Thyratrons			
	Spark gaps			
	Low inductance capacitors			
3. Plasma technology	Power supplies			
	Capacitors			
	Switches			
	Gyrotrons	Microwave transmission, jamming		
	Neutral beam injectors			
	Plasma clean-up equipment			
	Flushing systems			
4. Materials technology	First wall materials			
	Other materials of construction.			
E. Imploding liner technology			Electric power production	Poland, USSR.
1. Computer software technology	Computers			
2. Switching technology	See II.D.2.			
3. Implosion system technology	Magnets	Nuclear and non-nuclear weapons		
	Liners			
	High explosives			
	Lasers			
	Plasma guns			
	Other plasma preparation equipment.			
F. Impact fusion technology				USSR, France.
1. Impactor technology	Multi-stage gas guns			
	Specially developed projectiles.			
	Electromagnetic guns			
	High energy density capacitors.			
	Switching equipment			
	Rotating flywheel energy storage systems.			
	Propellants			
	Targets			
2. Computer software technology	Computers			
G. Diagnostics technology	Streak cameras	Nuclear weapon development		
	Neutron detectors			
	Gamma detectors			
	X-ray detectors			
	Fast analog circuitry			
	Fast oscilloscopes (pico-second sweep).			
	Computers			
	X-ray transmission equipment			
	Neutron radiography equipment			
	Microwave acoustic microscopy equipment.			
	Spectroscopy equipment			
	Magnetic field measuring equipment.			
	Thompson scattering equipment.			
	Interferometry equipment			
	Pin probes			
	Flash X-ray equipment			
	Diagnostic lasers			
III. Reactor production of nuclear materials				
A. Tritium producion technology		Nuclear weapons	Fusion reactors, self luminous components, batteries, sensors, D-T neutron sources.	France, PRC, UK, USSR.
	Reactors			
	Lithium alloys			
	Distillation equipment			
	Lithium target fabrication equipment.			
	Tritium recovery equipment			
	Calorimeters			
B. Tritium handling technology		Nuclear weapons		France, PRC, UK, USSR, Hungary, Netherlands, Poland.
	Pumps			
	Valves			
	Piping			
	Mass spectrometers			
	Absorption beds			
	Glasses with special diffusion properties.			
	Measuring instruments			
C. Pu-239 production technology		Nuclear weapons	Breeder reactors for electric power production.	UK, France, USSR, PRC, India.
	Reactors			
	Target fabrication equipment			

DOE Critical Technologies—Continued

Critical technologies	Keystone hardware	Military applications	Civil applications	Foreign availability
	Fuel shears			
	Solvent extraction equipment			
	Dissolution equipment			
	Ion exchange materials and equipment.			
	Off-gas treatment systems			
	Glove boxes			
	Analytical chemistry equipment.			
D. Pu-239 fabrication technology		Nuclear weapons		UK, France, USSR, PRC, India, Argentina, Japan, Taiwan.
	Equipment for reduction to metal.			
	Casting furnaces			
	Graphite molds			
	Glove boxes			
	Metallurgical equipment			
	Metal forming machinery			
	Equipment for production of oxides, nitrides, carbides of Pu.		Mixed oxide (nitride, carbide) fuels for breeders.	
	Pellet presses		MOX	
	Analytical equipment			
	Sintering furnaces		MOX	
	X-ray machines			
	Metallographic equipment			
	Other measuring equipment			
E. Pu-238 manufacturing technology		Heat source for thermoelectric power generation.	Heat source for thermoelectric power generation.	USSR.
	Reactors			
	Np-237			
	Fuel shears, dissolution, separation, precipitation and reduction equipment.			
F. Reserved				
G. Reserved				
IV. Nuclear weapons technology		Nuclear weapons	Plowshare, Orion, Pacer	UK, France, USSR, India, PRC.
A. Computer technology		Many	Many	France, FRG, Japan, UK, USSR.
1. System manufacturing technology	High performance, high capacity computers.			
	Cooling systems			
2. Component manufacturing technology	High performance, high capacity peripheral memories (discs, tapes).		Many	
	Magnetic bubble memories (See VIII.A.).			
3. Interactive graphics technology	Interactive terminals		Many	
4. Operating systems technology	Interactive terminals, Other I/O.		Many	
B. R&D technology 1. Computer calculations	Computers, Terminals, Printers	Many	Many	Many countries.
a. Language technologies				
b. Code technologies				
2. Development testing technology	Pin technique equipment	Explosives research	Ballistics	
	High speed framing cameras	Explosives research	Fusion technology	
	High speed streak cameras	Explosives research	Fusion technology	
	Flash x-ray machines	Explosives research		France, Sweden.
	Image intensifiers		Radiology	
	Microdensitometers			FRG.
	High explosive firing equipment	Explosives research	Prospecting	Many countries.
	Firing site	Explosives production and research.		
	Particle accelerators	Particle beam weapons, effects	Flash x-ray	France, USSR, PRC, others.
	Computers for data reduction			
3. Live nuclear test technology				UK, France, USSR, India, PRC.
	High speed oscilloscopes	Laser weapons, radar, others	Fusion technology	
	High speed digitizers		Fusion technology	
	High speed counters			
	High quality large diam. coax cables.		TV transmission	
	Fiber optics cables and components.		Telephone cables	
	Photomultiplier tubes	Neutron, gamma detectors, others	Fusion technology, others	
	Time domain reflectometers			
	High speed calibration and data recording equipment.		Fusion technology	
	Radiochemistry equipment			
	Large-hole drilling equipment			
	Computerized network analyzers.	Missile component testing		Sweden.
	Microdensitometers	Photo analysis	Phto analysis	France, UK.
	Image enhancement equipment	Info, processing, remote sensors	Info. processing, LANDSAT, earth resources sensing.	France, UK.
4. Component fabrication technology				UK, France, USSR, PRC, India.
	UF_6 to metal conversion equipment.			
	PuO_2 to metal conversion equipment.			
	Uranium casting equipment	Uranium penetrators		
	Uranium machining equipment	Uranium penetrators		
	Depleted or natural U components.	Uranium penetrators		

DOE Critical Technologies—Continued

Critical technologies	Keystone hardware	Military applications	Civil applications	Foreign availability
	Enriched U components			
	Plutonium casting equipment			
	Plutonium machining equipment			
	High explosives casting equipment.	High explosive shells, bombs, etc.		
	High explosives pressing equipment.	High explosive shells, bombs, etc.		
	High explosives machining equipment.			
	Electrochemical machining equipment.	Aircraft	Aircraft	
	Explosive forming facilities			
	Shear forming equipment			
	Isostatic and hydrostatic presses.	Conventional munitions	Aircraft engine parts	
	Electron beam welding equipment.	Many, aircraft parts	Pipelines, medical uses, aircraft	
	Laser welding equipment			
	Many	Many		
	Filament winding machines	aircraft parts, rocket motors, reentry vehicles.		
	High precision 2–5 axis NC machine tools.	Ordnance, aircraft parts	Tool & die mfg., ceramics, aircraft parts.	Japan, FRG, France, Italy, UK, Switzerland, Belgium.
	Dimensional inspection machines (contact, non-contact, laser).	Many	Many	
	Frequency synthesizers	Radar, communications and ECM equipment.		
	Spectrum analyzers	Radar, communications and ECM equipment.		
	Laser holography equipment			
	X-ray holography equipment			
	X-radiography equipment			
	Laser interferometry equipment.			
	Laser feed back systems	Mirrors	Laser fusion technology	France.
	Rotary and linear feedback systems.	Aircraft, naval, ordnance parts	Tool & die uses, engine parts	Switzerland, FRG, Japan.
	High precision spindles (air bearings and vibration isolation).	Mirrors	Laser fusion, other optics	Japan.
	High precision linear induction motors.	Mirrors	Laser fusion, other optics	Netherlands.
	High precision lead screws	Mirrors	Laser fusion, other optics	UK.
	Single point diamond inserts	Mirrors	Laser fusion, other optics	FRG, Netherlands (?), S. Africa (?), Israel (?), USSR (?).
	Numerically controlled systems hardware.	Many	Auto, machinery, aircraft production	
	Advanced NC systems		Nuclear reactors	
	Leak detection equipment for 10^{-14} cc/s.	Neutron generator tubes	Hermetic seals, IC mfg., electron tubes.	Japan.
	Electron microprobes			France.
C. Production technology	See IV.B.4			
D. Special component technologies	High voltage power sources (battery driven).	Smart bomb & missile fuzing	Accelerators	
	Exploding bridgewire detonators.		Blasting	
	Cold cathode switches (Krytorns, sprytrons).			
	Neutron sources		Oil well logging, uranium logging, neutron standards, neutron radiography, neutron medicine.	The Netherlands, USSR.
	High energy density capacitors			
E. Special materials technologies 1. Fabrication technologies.	Filamentary materials	Reentry vehicles, aerospace components.	Space vehicles, aerospace components.	Japan, France.
	Composite materials	Aerospace components, structures	Aerospace components, structures, gas & liquid storage.	France.
	Boron-10	Naval reactor propulsion systems	Reactor controls	USSR.
	Beryllium	Guidance systems, optical systems, structures.	Electronics components, x-ray windows, space systems.	France, USSR, UK
	Beryllium-stainless steel alloys			
2. Purification technology	Ultrahigh purity rare earths (Sc & Y).			
3. Pyrotechnics fabrication technology	Metal hydride synthesis facilities.	Ordnance weapons, missiles	Fireworks, valve actuators, gas	Many countries.
		Deterrent containers	Propulsion	
4. Thermite composite fabrication technology.	Special compaction dies	Ordnance weapons, deterrent containers.	Welding, deterrent containers	Many countries.
5. Plasma polymerization technology (thin films).	Plasma coaters and cleaners	Ordnance weapons	Protective coatings for corrosion prevention.	
6. Explosive recrystalization technology		Ordnance weapons	Commercial explosives, explosive devices.	
7. Large diameter, high pressure storage vessel technology.				
8. Paper honeycomb fabrication technology	Hobe machine	Aircraft, missiles	Aircraft	

DOE Critical Technologies—Continued

Critical technologies	Keystone hardware	Military applications	Civil applications	Foreign availability
9. Silicone adhesive technology	Vinyl-addition potting equipment.	Reversion-free, in-place potting	Many fabrication processes	
	Blown-silicone cushion equipment.	Low compression-set pre-load pads	Long life and out-gas-free assemblies.	
10. Nickel carbonyl [$Ni(CO)_4$] coating technolgy.			Corrosion prevention, sealing, Mechanical envelope.	
11. Thin film hydriding	Thin film targets	Neutron sources	Oil exploration, uranium exploration, neutron medicine, neutron standards, neutron radiography.	UK, Netherlands, USSR.
12. Electrical feedthrough technology	Cermet feedthroughs	Neutron sources	Neutron radiography	Netherlands, USSR.
V. MHD		Electric power generation, propulsion.	Electric power generation, magnetic fusion, topping cycle for steam power plants, explosive driven MHD for earthquake prediction, deep electrical sounding.	France, FRG, Japan, UK, USSR, Poland.
A. Superconducting magnet technology	See I.A.4.a			
B. Materials technology	Electrodes			
	Channels			
	Seed materials			
	Combustion chamber			
	Large valves			
	Slag condensation systems			
	Seed recovery systems			
	Heat exchangers			
C. Liquid metal handling technology			LMFBR's	
	Pumps			
	Heat exchangers			
	Metal-gas separators			
	Nozzles			
D. Plasma studies			Magnetic confinement fusion	
VI. Advanced seismic detection		Nuclear test detection	Earthquake detection	USSR, Sweden.
A. Seismometer technology	High sensitivity seismometers			
	Wide band seismometers			
	Remotely operated equipment			
B. Signal processing technology	Computers			
C. Data and command transmission and reception technology.	Satellites			
	Digitizing circuitry			
	Authentication logic			
VII. Satellite technology		Nuclear test monitoring, weapons intelligence, weapons delivery, global positioning satellites, ABM detection, intell. monitoring.	Astrophysics observations, geophysics observations, meteorological observations, LANDSAT monitoring.	PRC, USSR, Japan.
A. Detector technology	Radiation detectors			
	Photo diodes			
	Photomultiplier tubes			
	Radiation hardened electronics.			
	Receivers			
	Transmitters			
B. Data transmission and reception technology.				
VIII. Electronics				
A. Semiconductor mfg. technology		Proximity fuses, missiles, electronic warfare, radars, communication and navigation, weapon control, battlefield information, others.	Computers, control systems, consumer goods.	Japan, France, Hong Kong, Singapore, others.
	Microprocessors	Many	Many	Japan.
	Charge coupled devices			
	Continuous process tantalum sputtering equipment.			
	Photolithographic masks			
	Automated inspection equipment.			
	LSI circuits			
	VLSI circuits	Telemetry, conventional weapons, comm. and control.	Electronic equipment	FRG, Italy, Japan, Netherlands, USSR.
	Silicon photodiodes			
	Gallium arsenide and gallium phosphide devices.	High temperature uses		
	E-beam equipment for chip etching.			
	UV equipment			
	X-ray equipment			
	Equipment for bonding with silver.	Electronic equipment	Electronic equipment	FRG, Japan, UK.
	Wafer steppers	Electronic equipment	Electronic equipment	
	Ion implantation equipment (for wafers larger than 2" diam.).	Electronic Equipment	Electronic Equipment	
	Hyperpure Ge	Gamma ray detection	Gamma ray detection	
	Radiation hardened discrete, LSI, and VLSI circuits.			
	Paralene coating equipment			
	Clean rooms			
	Wire bonding machines			
	Diffusion furnaces			
	Computers for circuit analysis			
IX. Safety, security, and survivability technology.		Security of nuclear weapons, site, security, safeguards.	Industrial security, fiscal security	
A. Reserved				

DOE Critical Technologies—Continued

Critical technologies	Keystone hardware	Military applications	Civil applications	Foreign availability
B. Encryption technology	Microprocessors			
C. Electronically assisted physical security		Weapon storage site protection	Power plant protection	
	Sensors			
	Microprocessors			
	Signal processing equipment			
D. Weapon survivability	Sensors			
	Microprocessors			
X. Reserved				

C. Technology Descriptions

I. Nuclear Fule Cycle Technology

A. Uranium Enrichment. The only naturally occurring fissile material suitable for use in nuclear weapons is uranium-235 (^{235}U). It makes up approximately 0.71% of natural uranium. Some nuclear reactors contain only natural uranium fuel. Others require enriched fuel, that is, the fuel must be made of uranium that has been processed so that the ^{235}U concentration is higher than 0.71%. For use as fissile material in nuclear weapons, uranium must be highly enriched. The gaseous diffusion method of enrichment, which depends on the fact that the rate of diffusion of a gas is inversely proportional to the square root of its molecular weight, has been the method used. It requires a large plant with many (several thousand) diffusion stages, and has high power requirements. Some of the newer technologies developed or under development offer possible cost advantages for large scale production, and may be more adaptable to smaller scale use.

B. Reprocessing Technology. Reprocessing is required for optimal use of reactor fuel, whether the goal is plutonium production for weapons, or production of power. Plutonium-239 (^{239}Pu) is a suitable fissile material for weapons and for reactor fuel. When ^{238}U is exposed to thermal neutrons, as in a reactor, ^{239}U is formed by neutron capture, and decays by beta emission to ^{239}Np, then to ^{239}Pu. For recovery of the ^{239}Pu thus formed in reactor fuel elements, reprocessing is required. Various other isotopes of Pu also are formed, some of which are undesirable for use in weapons. Suitable fuel management and refueling timing can minimize their formation and obviate the need for Pu isotope separation, as well are reduce the safety hazards during reprocessing.

Uranium-233, which is also fissile and does not occur in nature, can be produced by neutron capture by thorium-232. Its recovery also requires reprocessing.

C. Heavy Water Production. Heavy water (also known as deuterium oxide, D_2O) occurs in nature. Using ocean water as a reference, the atomic abundance of deuterium in natural hydrogen is 0.0149%.

Three methods for separating D_2O from light water have been known for many years. Electrolysis of water and distillation both preferentially concentrate D_2O in the residue. Similarly, in the reaction $H_2O + D_2O — D_2 + H_2O$, the reverse reaction predominates, and at equilibrium the ratio of ^2H to ^1H in the liquid phase (i.e. D_2O to H_2O) is about three times as great as in the phase (that is D_2 to H_2).

Heavy water is of interest to the weapons community because it is a source of deuterium for the D–T reaction of thermonuclear weapons, and because of the fuel usage and conversion characteristics of heavy water moderated nuclear reactors. Heavy water moderated reactors, such as Canada's CANDU reactors, can be fueled with natural uranium, and have fairly high conversion ratios of ^{238}U to ^{239}Pu because of deuterium's very low neutron capture cross section. They therefore allow the possibility of production of weapons grade fissile material without need for access to uranium enrichment. This is also possible using graphite as a moderator, but it is not possible using ordinary water.

D. Fuel Fabrication. Fabrication of reactor fuel elements is a necessary link in the chain of processes leading from raw uranium ore to the use of reactors for power or the production of weapons grade plutonium. Dependence on an outside supplier of fuel elements may make it difficult or impossible for the possessor of a reactor to manage refueling timing to optimize ^{239}Pu production. Technology used in the fabrication of some types of fuel elements may also be applicable to the facrication of weapons components. For example, glove box lines, alpha-counters, machine tools, and other equipment would be the same, or similar.

E. UF6 Production. Uranium hexafluoride (UF_6) is the most volatile uranium compound known. At room temperature it is a dense white solid with a vapor pressure of 120 mm, but it can be readily sublimed or distilled. The gaseous diffusion enrichment process, as well as other enrichment processes such as the gas centrifuge use UF_6. See section I. A. for discussion of enrichment.

F. Fission Reactors. Many aspects of fission reactor technology are useful in providing a technology base for nuclear weapons development. For example, computer codes for calculating the progress of reactor excursions may be applicable to analysis of weapon neutronics. Reactors also provide the ability, to varying degrees, to breed or form ^{239}Pu from ^{238}U, and tritium from ^6Li, for use in weapons. Experience with nuclear instrumentation and familiarity in dealing with radiation problems are also helpful in a weapon program. Criticality experiments for weapon design studies resemble some of the aspects of reactor operation. Operation of research reactors would be especially good experience.

G. Electro-nuclear Breeders. Electro-nuclear breeder technology, to breed ^{239}Pu or ^{233}U with the aid of fission sustained with the assistance of neutrons generated from a target bombarded by high energy particles, is of interest for two reasons. The fissile material that is bred can be used in weapons, and the charged particle source and accelerator technologies developed can be applied in other critical areas.

II. Fusion Technology

A. Laser Technology. Laser technology has many possible critical applications, ranging from isotope enrichment to laser guided weapons to laser weapons. Supporting technologies for high voltage systems also have multiple applications. Energy storage and switching equipment is common to most directed energy systems.

B. Charged Particle Accelerator Technology. This technology is necessary in some approaches to inertial confinement fusion, in directed energy weapons studies, fusion reactor materials development, and to some extent in magnetic confinement fusion and basic physics research. The relevance of accelerator technology to national defense makes it a critical technology in a military sense, but it is also critical politically and possibly economically as well. Research and development in this area is well advanced in the USSR, and there has tended to be rather unrestricted exchange between the USSR and the US concerning new component design concepts. At the same time, no one is sure that exchanged information has included the most highly developed refinements.

C. Fusion Pellet Technology. Aspects of fusion pellet technology may have direct applicability to fusion weapons.

D. Magnetic Confinement Technology. Plasma studies of MHD stability in magnetic confinement could support understanding of weapons hydrodymamics. Also deuterium and tritium reaction rate studies as well as the technology of handling these materials would be transferable to weapon programs.

E. Imploding Liner Technology. Implosion technology has been fundamental to nuclear weapon development since the days of Fat Man. Modern calculation technology, detonation systems, and experimental diagnostics all still have application to weapons.

F. Impact Fusion. To achieve impact fusion, a massive (by controlled inertial fusion standards) target of a few milligrams of deuterium and/or tritium is accelerated to velocities of the order of 10^6 m/s. A difficult part of the technology is achieving sufficiently high speeds to bring the material together forcefully enough to cause fusion.

G. Diagnostics Technology. Diagnostics instruments for controlled fusion, with requirements to function under conditions of high temperature, in a radiation environment, or with very short time response characteristics, are also important in nuclear weapons testing. Some fusion diagnostic equipment is useful also in nuclear weapon R&D programs for diagnosing the hydrodynamic performance of device mockups.

III. Reactor Production of Nuclear Materials

A. Tritium Production Technology. Tritium (T) is produced in nature by the action of cosmic radiation on nitrogen in the upper atmosphere. It is also produced as an unwanted contaminant in the water coolant of ractors, and may be produced through neutron bombardment of lithium-6 by the reaction

$$n + {}^{6}_{3}Li \rightarrow {}^{4}_{2}He + T + 4.8 MeV$$

It is of interest because of its use as a fuel in thermonuclear weapons. Deuterium (D) is naturally occurring, and fusion may be made to occur between two deuterium nuclei. However, the peak reaction rate coefficient of the D-D reaction is considerably less than that of the D-T reaction.

B. Tritium Handling Technology. Tritium is a beta emitter. Being an isotope of hydrogen, it can enter into all the chemical reactions of hydrogen, including those in the body. Gaseous tritium is not significantly absorbed into the body, but water containing tritium is. It can be taken up through the lungs or mouth or absorbed through intact skin and is dispersed through all the body fluids, though exchange with the hydrogen in other body tissues is slow. In addition to its radioactive health hazard aspects, tritium has all the handling difficulties of ordinary hydrogen, with higher safety and cost penalties for failure. Experience in the handling of the material would be valuable in a weapon program.

C. Plutonium-239 Production Technology. Plutonium does not occur in nature except in very minute quantities. Several isotopes are known. Plutonium-239 is produced by neutron absorbtion by ^{238}U and subsequent beta decay. It is a fissile material that can be separated chemically from uranium, an easier process than the isotope enrichment techniques needed to produce highly enriched uranium. Plutonium can also be used as a reactor fuel. A weapon made of plutonium can be smaller in size than a comparable weapon made of uranium. Contamination of ^{239}Pu with other Pu isotopes can make it less desirable for weapons and increase the hazards of handling it.

D. Plutonium-239 Fabrication Technology. Nuclear weapons components must be fabricated with good precision. Plutonium is a difficult and hazardous material to handle. It is toxic and an alpha emitting carcinogen. Plutonium is very complex, metallurgically. Working with ^{239}Pu, as with any fissile material, requires that caution be exercised to avoid forming a critical mass when it is unintended.

E. Plutonium-238 Manufacturing Technology. Pu-238 is an alpha emitter with a half-life of 86 years. It is useful in radioisotope-powered thermoelectric generators and has been used for such applications as powering seismic and other experimental instruments on the lunar surface for Apollo missions. Unique handling difficulties arise from the fact that alpha decay keeps it at a relatively high temperature. Some of the processing and handling equipment for Pu-238 is the same as for weapon grade plutonium.

F. Reserved.

G. Reserved.

IV. Nuclear Weapons Technology

A. Computer Technology. A very important element in a modern nuclear weapon R&D program is the correlation of experimental data with self-consistent theoretical models. Computers provide a convenient and effective way to carry out such correlations and to predict improvements within the limitations of the models. Modern computer manufacturing technology comprises not only the manufacturing technology of highly integrated solid state circuits, but also includes the general architecture of the system, that is, its logic flow, peripherals, operating system, and other overall characteristics. A very crucial element is the cooling system design.

Computers are very powerful tools in many areas of research as well as in development and production of all kinds of hardware of military interest. Large scale production and use of computers at least has the potential of affecting the economics of production management in many areas. Many U.S. companies have a competitive edge because of the wide use computer controlled processing.

Computer manufacturing technology is thus considered critical because of the wide applicability of such machines throughout all levels of industry. Loss of the U.S. advantage in computer availability could be detrimental to the security of this country.

B. R&D Technology. Nuclear weapon research and development methodology has developed in the U.S. over thirty-five years to a rather sophisticated state. The methodology is optimized to "fine-tune" weapon designs, guarantee reliability, explore the limits of design, and reveal new phenomena that can affect the next generation of weapons. The U.S. nuclear weapon R&D technology as a whole may not mesh well with the aims and intentions of another country, but knowledge of it and access to the associated hardware would be a boom to a new program if only to save the time and effort consumed in reinventing ways to acquire data, and assessing which are the important pieces of data to be gathered in the program. It is worth a great deal to know which particular ways to fabricate workable components, which ways to carry out critical tests, and which methods to gather data actually work best. We would estimate that years could be saved in an R&D effort if these technologies and hardware were widely available.

C. Production Technology. Nuclear weapon "production" is not production in the usual American sense of the word. There are very few processes in the final manufacturing that were developed especially for the production phase. Materials certification, fabrication techniques and inspection are for the most part the same as those used in the R&D portions of the programs. Final assembly and packaging are additional large scale activities that characterize nuclear weapon production, but aside from these, production technologies are substantially the same as R and D component fabrication processes. There are advantages to doing things this way. Processes are developed at no cost to the production program, and development testing is done on components that are going to look very much like the final production items. For production of a limited number of complex objects, the system is optimum.

Some portions of the fabrication technologies are critical because of the unusual requirements of working with nuclear materials. Making good parts of these materials is a non-trival undertaking. In other cases there are "Black Arts" develped which give good yields, or special materials must be used to avoid compromising the performance of the end device. These technologies are critical because knowledge of them can result in a better product, a higher yield of acceptable parts, a less expensive process, or a more timely appearance of a new design.

D. Special Component Technologies. This category of technologies is critical because in general the technologies have been expensive and time consuming to acquire, and result in end products that are crucial to the reliable and proper functioning of a nuclear weapon. The problems solved by these technologies may be solved in other ways, but generally speaking the US technology is advantageous in the context of the US ground rules. Knowledge of these technologies could give relief from design constraints in developing programs, and allow advantages in time, system architecture, and support facility complexity.

E. Special Materials Technologies. These are some of the technologies that are supportive of the component fabrication technologies described earlier. Each requires development time, each provides some kind of advantage to the system design engineer, and each results in an overall advantage to the end product. The final improvement in a complex and highly optimized assembly may be large even though an improved component manufacturing technique may seem relatively minor. These supporting technologies are critical in the sense that they make available to an adversary some of the design edge that a seasoned manufacturing array possesses.

V. MHD

When a thermally ionized gas or a conducting liquid is forced at high temperature, pressure and velocity through a duct situated in a transverse magnetic field, an induced voltage appears in the third mutually perpendicular direction, and this voltage may be tapped by electrodes within the duct. The heat required may come from combustion, nuclear power or solar energy. Magnetohydrodynamics (MHD) has the long range potential, when combined with a bottoming cycle, for producing electricity from coal combustion with an efficiency of about 50%. MHD can provide a portable system for conversion of chemical to electrical energy with high efficiency.

A. Superconducting Magnet Technology. Superconducting magnets are used in magnethohydrodynamics applications to achieve intense fields with low loss. Superconducting magnet technology is also of use in several other areas of interest.

B. Materials Technology. MHD makes heavy demands on materials technology. High performance electrodes must operate in a high temperature, high velocity, corrosive environment. The channel must also survive the hostile environment. Niobium and titanium are useful for the superconducting magnets.

C. Liquid Metal Handling Technology. Liquid metal handling technology developed for use in MHD applications in which liquid metal is the conducting fluid is also applicable to liquid metal breeder reactors, which can produce fissile material for use in weapons or in reactors.

D. Plasma Studies. Study of plasma stability problems under various conditions of implosion and explosion can lead to an improved understanding of weapons hydrodynamics.

VI. Advanced Seismic Detection

This technology is critical in the sense that improvements in current seismometer technology, signal processing technology, transmission and reception technology, and integrated circuit technology may allow better detection thresholds and more accurate yield calibrations for underground shots. These improvements could be important in proliferation detection and n-th country device yield estimation. Currently the big problem to overcome in threshold detection appears to be background noise, and so one might expect that the best chances for improvement would be in signal processing to read through the noise, or in methods to suppress noise.

VII. Satellite Technology

A. Detector Technology. Satellites provide one of our principal means for detecting clandestine nuclear bursts in the atmosphere or in space near the earth in monitoring for treaty compliance, and monitoring for proliferation indications. Substantial amounts of intelligence can be gained about the level of sophistication of weapon design, as well as about the existence and location of a test. This information can be especially important in the case of a first test by an n-th nation. Knowledge of specific performance parameters of satellite detection systems could enable others to design countermeasures to deceive the detection systems and thereby reduce the information available to us in this vital area.

B. Data Transmission and Reception Technology. Data gathered by satellite-borne detector systems is of value only to the extent that it can be transmitted to and received by earth stations. The quantity of data that must be transmitted may be greatly reduced, and the effectiveness of encryption applied to it enhanced by inclusion on the satellite of memory and computing power, which are made possible by microminiturization of components to permit the achievement of sophisticated processing with minimal weight and power requirements.

VIII. Electronics

Every facet of the US defense capability depends upon electronics and most depend specifically on semiconductor electronics. Furthermore electronics has very significantly impacted upon the US production economy. Computerized processing, controlling, and recording have enabled US industry to sustain significant increases in productivity. Electronics technologies are critical because they are in widespread use, are very powerful in solving certain kinds of problems, and control the functions of sensitive defense systems.

A. Semiconductor manufacturing technology. The basic ideas of semiconductor functioning are of course widely known. Integrated circuits are collections of semiconductor elements and passive circuit elements in a single package. The critical factor in these packages is the manufacturing processes and machinery. Developments in automated fabrication and inspection processes have made possible more reliable, more versatile, smaller packages that can perform a greater array of functions. These fabrication processes are known to some extent world wide, but only a few countries are working at the edge of the technology. Preserving the US lead in these manufacturing technologies is critical to the maintenance of superior equipment for defense and an economic advantage in goods for export.

IX. Safety, Security, and Survivability Technology

A. Reserved.

B. Encryption Technology. Encryption technology is used for the concealment of information. It supports compaction of information to reduce transmission requirements. Encryption is also used to control identification or validation keys in many applications in which it is necessary for equipment to verify the identity of an individual or the validity of an order, before granting access to the individual or obeying the order. Knowledge of advanced encryption technology may both improve an adversary's capabilities in his own use of encryption, to our detriment, and enable him to penetrate our systems, gaining information, gaining access, or causing the execution of false commands.

C. Electronically Assisted Physical Security. Technology relating to the physical protection of weapons facilities should be considered for protection from export. The understanding of this technology provides insight into ways of defeating the protective measures. Extensive R&D relative to protection in the commercial nuclear reactor area has been conducted for several years within the DOE laboratories. Much of this information has been made available through the International Safeguards program to foreign countries and in that regard may be too late to protect. Nevertheless, newer and more sophisticated computer-based techniques for analyzing data from sensors around a protected area are being developed. These techniques reduce false alarm incidence and provide intruder tracking in a way that vastly improves the protective capability of an intrusion detection system. Both the system operational capability and the related devices represent strongly sensitive areas in the overall physical protection of facilities.

D. Weapon Survivability. In defining semiconductor technology that should be protected from export, one extremely innovative area that should be considered is the applicaton of microprocessors and microcomputers. These powerful control devices are showing up in many of our most modern weapon systems. The manner in which these devices carry out their control and monitoring function could be extremely sensitive since that information could well point to vulnerable aspects of the system. In the area of future application of microcomputers in weapon systems, the area of adaptive control should be considered. The microcomputer contains the mathematical capability to implement complex adaptive algorithms to reprogram a weapon based on measured data on the well-being of critical components or environmental factors. Thus, the microcomputer could well provide the ability for the weapon to sustain substantial damage and still be reprogrammed to accomplish its mission. The Russians have for years developed advanced adaptive control theory and techniques. The microprocessor provides both them and us the opportunity to develop self-healing weapon systems. Applications of microcomputers to such problems should be treated as sensitive technology.

X. Reserved.

References

1. Chapman, Ray E., "Proposed New Approach to Export Control," DOE/OISA memorandum to distribution dated Aug. 14, 1979, unclass.
2. J. Fred Bucy, et al., "An Analysis of Export Control of U.S. Technology—A DoD Perspective," a report of the Defense Science Board Task Force on Export of U.S. Technology, written at the request of USDDR&E, February 1976, unclass.
3. Export Administration Act of 1979, 50 USC APP 2401, Sec. 5D.
4. Herbert Kleiman, "Final Summary Report on Identification of Strategically Significant Technologies," work done at Battelle Columbus sponsored by Dept. of Defense Research and Engineering International Programs Office, January 1978.
5. "A Methodology for the Identification of Militarily Critical Technologies," Meyer Consultants, March 31, 1980, as modified by the (IDA) Critical Technologies Project.

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