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SECTION 6

MINIMUM AND MAXIMUM INVENTORY LEVELS AND POSSIBLE MARKET ACTIONS

6.1 Minimum and Maximum Inventory Levels

At the outset of this subsection, we should note that whereas by the end of 1979 all organizations included in the study had established more or less formal inventory policies for desired levels, considerably fewer organizations had given any real consideration to the concepts of minimum and maximum boundaries for their inventories. In fact, many of the organizations found NRI's list of basic definitions and the concepts of minima, maxima and trigger levels to be quite novel. Should the study be updated in the future with the Phase 1 participants, it is probable that considerably more data on boundary conditions would be generated with the participants having had time to assimilate the concepts.

Table 6.1.1 below presents the data for minimum inventory levels of fabricated fuel using the same format as previously established.

TABLE 6.1.1
Minimum Inventory Levels Weighted Only for
Countries with Policies
FABRICATED FUEL

	Number of Organizations		Months of Coverage			
Region	with policy	without policy	Range	1980	1985	1990
Eastern Asia	1	4	12	12	12	12
Japan	1	2	12	12	12	12
Europe	2	7	1-6	1.3	1.1	1.1
FRG	0	3	-	0	0	0
North America	1	6	6	6	6	6
U.S.	0	5	-	0	0	0

Where the actual inventory is less than the minimum objective, it can be expected that some action will be taken to bring the actual up to the minimum. Only in the Asia region is the actual less than the minimum, and then by only 1.2 months of forward coverage. Due to the relatively small sample size of participants in the survey relative to the total population, a difference of only 1.2 months may not be statistically significant enough by itself to "trigger" a market action to purchase additional fabrication. With the prospect of continuing reactor delays, the choice might be to simply handle the correction by waiting for the difference to "evaporate".

Table 6.1.2 below presents the data for maximum inventory levels of fabricated fuel, again using the consistent format.

TABLE 6.1.2

Maximum Inventory Levels

Weighted Only for Countries with Policies

FABRICATED FUEL

	Number of Organizations		Months of Coverage			
Region	with policy	without policy	Range	1980	1985	1990
Eastern Asia	3	2	12-24	17.3	16.3	16.3
Japan	2	1	12-24	17.3	16.4	16.4
Europe	2	7	3-12	3.4	3.2	3.2
FRG	0	3	-	0	0	0
North America	1	5	13	13	13	13
U.S.	0	5	-	0	0	0

For the relatively small number of data points, it can be seen that for Asia and the United States the weighted average actual levels in 1980 are less than the maximum acceptable levels. So no market action to reduce or otherwise dispose of fabricated fuel from inventory should be anticipated. In Europe there is an actual level of 3.7 months compared to a maximum objective of 3.4 months. The difference is small compared to the variance of the data, so no remedial market action should be anticipated. Thus, within the expected accuracy of the study, essentially all fabricated fuel inventories around the world covered by the study are within the "comfort zone" defined by the minimum and maximum boundaries.

On the following pages, sets of minimum and maximum tables are presented for enriched UF_6, natural UF_6 and UO_2, and U_3O_8 followed by a summary in Table 6.1.9 noting possible and actual market actions.

TABLE 6.1.3

Minimum Inventory Levels

Weighted Only for Countries with Policies

ENRICHED UF_6

Region	Number of Organizations with policy	without policy	Range	Months of Coverage 1980	1985	1990
Eastern Asia	1	4	12	12	12	12
Japan	1	2	12	12	12	12
Europe	2	7	6	6	6	6
FRG	0	3	-	0	0	0
North America	0	6	-	0	0	0
U.S.	0	5	-	0	0	0

TABLE 6.1.4

Maximum Inventory Levels

Weighted Only for Countries with Policies

ENRICHED UF_6

Region	Number of Organizations with policy	without policy	Range	Months of Coverage 1980	1985	1990
Eastern Asia	1	4	12	12	12	12
Japan	1	2	12	12	12	12
Europe	3	6	6-12	6.7	7.3	7.5
FRG	0	3	-	0	0	0
North America	0	6	-	0	0	0
U.S.	0	5	-	0	0	0

TABLE 6.1.5

Minimum Inventory Levels

Weighted Only for Countries with Policies

NATURAL UF_6 & UO_2

Region	Number of Organizations with policy	without policy	Range	Months of Coverage 1980	1985	1990
Eastern Asia	0	5	-	0	0	0
Japan	0	3	-	0	0	0
Europe	0	9	-	0	0	0
FRG	0	3	-	0	0	0
North America	2	4	0-6	1.8	3.6	2.7
U.S.	2	3	0-6	1.8	3.6	2.7

TABLE 6.1.6

Maximum Inventory Levels

Weighted Only for Countries with Policies

NATURAL UF_6 & UO_2

Region	Number of Organizations with policy	without policy	Range	Months of Coverage 1980	1985	1990
Eastern Asia	0	5	-	0	0	0
Japan	0	3	-	0	0	0
Europe	0	9	-	0	0	0
FRG	0	3	-	0	0	0
North America	3	3	3-20	4.2	5.6	5.3
U.S.	2	3	6-20	5.4	8.6	8.4

TABLE 6.1.7

Minimum Inventory Levels

Weighted Only for Countries with Policies

U_3O_8

Region	Number of Organizations with policy	without policy	Range	Months of Coverage 1980	1985	1990
Eastern Asia	1	4	12	12	12	12
Japan	1	2	12	12	12	12
Europe	4	5	6-24	14.5	13.6	15.1
FRG	1	2	12	12	12	12
North America	1	5	12	12	12	12
U.S.	1	4	12	12	12	12

TABLE 6.1.8

Maximum Inventory Levels

Weighted Only for Countries with Policies

U_3O_8

Region	Number of Organizations with policy	without policy	Range	Months of Coverage 1980	1985	1990
Eastern Asia	1	4	24	24	24	24
Japan	1	2	24	24	24	24
Europe	3	6	12-36	18.2	15.2	14.7
FRG	1	2	36	36	36	36
North America	3	3	6-24	12.2	14.6	13.6
U.S.	3	2	6-24	12.2	14.6	13.6

TABLE 6.1.9

Summary of Where 1980 Actual Inventory Levels Deviated from Minima/Maxima Criteria and Notes on Possible Market Actions

	1980 Actual	Boundary Criteria Minimum	Boundary Criteria Maximum
Fabricated Fuel			
Japan	10.8	12.0	
Europe	3.7		3.4
Enriched UF_6			
Japan	17.8 (1)		12.0
Europe	7.8 (2)		6.7
Natural UF_6			
Japan & Europe--no one had policies for minima or maxima for natural UF_6			
N. America	6.5 (3)		4.2
U_3O_8			
Europe	11.5 (4)	14.5	
N. America	11.8 (3)		9.5

Notes:

(1) For Japan, expect maximum use of downward flexibility provisions in enrichment contracts, possible termination of some of the eight remaining DOE LTFC contracts.

(2) Expect continued pressure on EURODIF by shareholder/customers to reduce output, use of lower tails assays to burn up more SWU's, use of downward flexibility provisions in DOE enrichment contracts, continued attempts to sell SWU's or EUF_6.

(3) Expect some sales from inventory by U.S. utilities, particularly during period of peak interest rates. In fact, some 2-3 million pounds of U_3O_8 were sold from December 1979 to May 1980.

(4) Expect some purchases in the spot market by European utilities. In fact, at least five purchases of quantities between 250,000 pounds and 1 million pounds (by the FRG) of U_3O_8 did occur between December 1979 and May 1980.

SECTION 7

ALTERNATIVE INVENTORY SCHEMES

7.1 Inventories Held by Enrichers Versus Corporate Inventory Policies

NRI asked participants if enrichers held inventories, would that affect or change their thinking on the levels of enriched or natural uranium they would carry in inventory for their own account. We found that the answer was universally: No, it would have no effect. Specifically, the question asked was:

Question

Some of the enrichers, most notably DOE at present, have inventories of enriched uranium at the enrichment plants. If EURODIF, Urenco and Techsnabexport were to hold inventories, would that influence your thinking on the levels of enriched (or natural) uranium you should maintain in your own inventory? How?

Responses

- No real thinking on it yet - nuclear program is too far in the future.
- Probably would not be set up by Techsnabexport, but it's a moot point. One time, when delivery of feed was delayed by a strike at the convertor (Eldorado Nuclear), customer and Techsnabexport were able to work out a painless accommodation.
- Question is not valid because Techsnabexport is a good supplier, and all other contracts are with DOE.
- No change in thinking because Techsnabexport is supplier and customer has great faith in them.
- For EURODIF - no, because if EURODIF held such an inventory the shareholder/customers would pay for the financing of it anyway. So it's better to hold your own inventory and retain control of it.
- For EURODIF - yes, but do not know how.
- No, because customer has no policy to maintain an enriched inventory.
- Question not applicable - DOE is only source of supply.

7.2 National/Regional Inventories Versus Corporate Inventory Policies

For this section of the study, the questions asked were:

Questions

- Does your Government maintain a national stockpile? Or is there some form of regional pool? If yes, what are the levels, assays, forms over time?
- Are there procedures established for accessing the stockpile? How do they work?
- Do you rely on those Government stockpiles to offset or backstop your inventory?
- Does your Government contribute to, or in some other way subsidize, your inventory? If yes, how?

Responses

- England - There is no national stockpile per se, but BNFL & CEGB are daughters of the UKAEA. In this respect, the government does contribute to the stockpile because the UKAEA needs uranium for its reactors, too.

- Sweden - There is no government, national or regional stockpile, but the government does, in a way, subsidize inventories by guaranteeing loans for stockpiled material.

- Spain - Parliament has approved the principle of a national stockpile of 2.5 times the annual requirements (not forward) on top of the inventory maintained by the national supply agent. No procedures have been established yet for accessing it. The implementation of the inventory policy must be worked out by the Ministries of Energy and Finance. Financing and administration are not yet certain. The national supply agent will rely on this stockpile, subsidized by the Government, as a backstop.

- France - "Not relevant. CEA, EdF, Government are indistinguishable."

- Canada - Yes, there is a national stockpile of natural Uranium held by UCAN, a Government agency. In 1980, the level of the stockpile is 5500 MTU. In the past, the stockpile was developed by the Federal Government to assist Canadian uranium producers Denison and Rio Algom during periods of depressed prices in the 1960's and early 1970's. Later it has been used to sell material in the market (to Spain), to help finance expansions of mines (Agnew Lake), purchases of equity by another Crown corporation (Eldorado Nuclear) in new reserves (Key Lake), and to smooth out supply (Ontario-Hydro). UCAN charges commercial interest rates.

- Germany - The FRG does have a national stockpile resulting from three separate DOE-FRG Offset Agreements over the last decade. The Government established the stockpile for emergencies, however, the utilities cannot access it. During the Canadian "safeguards" embargo, one utility tried to get material, but it was determined that "commercial" trouble was not an emergency. Basically, the stockpile is to be used as a backstop for Urenco. Therefore, the utilities cannot rely on the Government to backstop their inventories, and the Government does not subsidize utility inventories.

- Korea - There is no government or regional stockpile. The utility is part of the government, so it is not relevant whether the government subsidizes or contributes to the utility inventory.

- Japan - There is no government or regional stockpile except for the DOE Advance Sale material and EURODIF supply. EURODIF enriched UF_6 will be stored at Tricastin until needed. The government does not contribute to, or subsidize, the enriched UF_6 inventory.

- Japan - Japanese utilities are considering a one year's inventory of enriched UF_6. A special subcommittee was set up under the Federation of Electric Power Utilities whose members are the managers of fuel departments for each utility. The subcommittee work was sidetracked, however, by TMI and had not restarted by the end of 1979. There is no provision at this time for storage of inventory in Japan other than for fabricated fuel at reactor sites or at the fabricator. Therefore, all other Japanese inventory is spread around the world at wherever utilities can obtain storage space - enrichers, convertors and mine sites. Storage is a major problem for Japan. Further, it is not considered politically acceptable in Japan at this time to request new construction permits or licenses for additional national storage.

- Japan - There is no government stockpile. There are no plans right now for a Japanese government stockpile or Asian regional pool of enriched uranium. The DOE Advance Sale material is a kind of inventory. The enrichment interface is the most important of the fuel supply stages. It will be a long time until Japan has internal enrichment capability. It has been argued that a one year forward coverage of enriched UF_6 would be appropriate (A 2-3 year inventory of U_3O_8 will already be developed inadvertantly.) Since adoption of the AFC contract, SWU supply has been adjusted down to the most desired level for the reactors, but as protection this utility is now thinking of ordering forward. EURODIF SWU's are being received on original schedule even though the material is not needed. The EURODIF SWU's will go into inventory. Current inventory is one region of enriched UF_6 per operating reactor. The utility tries to keep inventory down because of finance costs. There is no help or subsidy from the Government.

Philippines - There is no government or regional stockpile in ASEAN countries. The Philippines are the only country in this group building a nuclear power plant so far. In the future, Singapore, Thailand and Malaysia may go nuclear, and then there may be a regional pool - not for fabricated fuel but for other forms. So far there have been no discussions on this. The utility is part of the government. Items imported by the utility, like fuel, are tax free, so the government does subsidize electricity to that extent, to minimize the cost of electricity to the people.

7.3 Alternative Inventory Schemes and the Free Market

Participants in the study were asked the following set of questions on alternative supply assurance mechanisms and the viability of a free market for nuclear energy commodities. The responses, with minimum editing, are presented below. They pretty much speak for themselves.

Questions

- For the last two years, particularly in the INFCE Working Group #3, concepts such as fuel-banks, safety nets, etc., have been discussed as ways to balance non-proliferation and supply assurance objectives. How have these concepts influenced your thinking on inventories?

- What are the pros and cons (the strengths/weaknesses) of the various schemes?

- Do you think the classic free market mechanisms can work for uranium, plutonium, enrichment, heavy water? Why?

- What are your ideas on a supply assurance system that would make sense for you? Can you conceive of a reliable stockpile system outside your own country? If so, what are your ideas on how such a system would work?

Responses

- Fuel banks, etc. are too political and [this national utility] would maintain an inventory policy anyway. The fuel-bank concept would probably not work. For strengths and weaknesses, refer to the Uranium Institute publication, _The Nuclear Fuel Bank Issue as Seen by Uranium Producers and Consumers_. This utility subscribes to the conclusions of this work. The free market mechanisms are the proper approach for nuclear fuel. The only supply assurance system that makes sense is an _internal_ policy of diversification and stockpiling.

- The fuel bank issue is too political and would probably not work. [This utility fuel manager] prefers to bet on free market mechanisms. Perhaps a regional pool of national utilities could work.

- We do not see the fuel-bank issue affecting thinking on inventories because it is doubtful that such a system will materialize. The major strength of fuel-bank schemes is the realization of <u>political control</u>. The weaknesses are:
    1. problems with transfer/retransfer of material
    2. cost
    3. they only address political problems.

  The free market mechanisms are preferred because they are easier for a company to address. There is no supply assurance system with sufficient appeal. This [national supply agent] subscribes to the Uranium Institute study referenced above.

- Fuel bank issues have not influenced thinking on inventories. Generally, fuel banks are <u>too</u> political and therefore could retard rather than enhance the operational flexibility of the utilities. The classic free market mechanisms can, and should, work for nuclear fuel. [This utility fuel manager] does not really see any supply assurance outside his company's own corporate devices working for them.

- These alternative concepts have not influenced [this utility fuel manager's] thinking on stockpiling. He feels no such scheme will help his country. Governments getting involved in the allocation of nuclear fuel is the main problem. Otherwise, the free market mechanisms should work. He sees no external fuel assurance scheme that would work for him.

- "Pffft! It is all ridiculous. We subscribe to the Uranium Institute study. [Major European utility]

- No future exists for fuel banks. The IEA worked on such a concept for 2 years (1975 concept) that did not get off the ground. The idea behind fuel-banks is more security with less material to reduce carrying costs for each individual. If it does not cover political risk, it is not of any use. The problem with a fuel bank for nuclear fuel is that it would be tied to nonproliferation, and individuals could face an embargo for non-proliferation reasons. A fuel-bank would be good for developing countries. However, current conditions for a fuel-bank are not favorable because all countries with significant nuclear programs already have inventories. A free market would be better, but [this national supply agent] does not see a market without political interference. He can visualize where four or five European countries could have a regional pool, but they would need a common understanding on non-proliferation policies, like that among EEC/Euratom members.

- It is too early for fuel banks to influence [this major national utility's] thinking on inventories. He hopes free market will work, but "up to now, it has only worked for prices." He declined to comment on a supply assurance scheme suitable to his company, other than to say their position was given to INFCE. It is a question for the central government, not the utility.

- [This major non-U.S. utility] does not think much of a fuel-bank. They think it is for the lesser developed countries. The General Manager for Fuel only knows about the fuel bank, not the other schemes. "Free market mechanisms! In a sense - no. It would come closest for U_3O_8. Enrichment and plutonium are really out of the question because of non-proliferation." As an ideal he wishes some arrangement could be worked out, but practically does not think it could be. He had hoped INFCE could produce something, but it has not turned out that way. An international scheme is a difficult subject that must be tackled, but he does not think it will work out. Energy supply is very political and very nationalistic. In the case of uranium, this country has built its stockpiles outside its national borders to date. But that will be the end of it. There is no intention to build stockpiles outside the country in the future.

- Recent initiatives on supply assurances have had no effect on [this non-U.S.utility's] thinking on inventories. Fuel-banks and safety nets will work okay under good conditions. The utility is doubtful, however, about future conditions. On the free market: "I would hope so, but nowadays it does not work". On new schemes for supply assurance: "It is very difficult. I am pessimistic. Looking at the status of petroleum, it is very hard to imagine what would work."

- INFCE ideas do not affect anything. [This country] supported the fuel-bank idea, but it is nowhere. The idea is good, but actually it is difficult to set up. If it only handles money, like the IMF, it can work, but not if it handles material. Material is very sensitive. Safety net is an idea of European countries for political considerations. The free market has worked well for the last 10 years. There is no reason why it cannot continue. If some electric utilities want inventories, they should keep them in their own country. However, if a country does not have fuel cycle facilities, such an inventory is almost useless. [This national utility] trusts the free market system, and they trust the United States. One or two countries may make trouble in the future. In spite of supporting the fuel-bank movement, it does not affect thinking on inventories.

- If a good working fuel-bank is set up, it would affect [this small national utility's] plans on inventory. It would use a fuel-bank. On the free market [the personal opinion of the fuel manager] is that uranium is an energy source like oil and coal, and uranium can not help but be influenced by the others. However, they are not really free markets. On systems that might work, one of their delegates to INFCE has a lot of ideas in his head. Outside of a fuel-bank, the alternative is bilateral agreements with countries, for example like Australia and Canada, which overlap.

SECTION 8

APPLICATION OF INVENTORY DATA TO NUCLEAR FUEL DEMAND FORECASTS

8.1 Perspective on Nuclear Fuel Demand

The calculation of nuclear fuel demand has become increasingly difficult as the nuclear power industry has matured. Before the introduction in 1973 of DOE's Long-Term, Fixed-Commitment contract and the similarly structured contracts of EURODIF and Techsnabexport in 1974, demand calculations were based on the reactor operation schedules, or what is termed reactor requirements. With the more restrictive contract terms and conditions, particularly (although not limited to) enrichment contracts, utilities with delayed reactors were forced to take uranium in advance of their actual reactor needs. Recognizing the impact of such contracts gave rise to a second method of calculating demand based upon modelling actual contract commitments for enrichment and/or uranium.

Both methods are used today to calculate demand. Both methods have inherent limitations and inaccuracies. The forecasts based on reactor requirements are certainly the crudest, forecasting in a practical sense only a lower limit on demand. Predicting demand based on actual contract commitments is better, provided one knows all the contracts and how each works. This can be difficult--particularly in U_3O_8--where contract terms are kept quite confidential. However, even with publicly available standard contracts like DOE's enrichment contracts, recent developments have led to the need for further refinements in contract-based demand calculations.

The flexibilities of DOE's Adjustable, Fixed-Commitment enrichment contract have brought about a recognition that demand based on current contract commitments can sometimes disappear. Through assignments or pooling of contracts, whole contracts may, after a short period of time, have their withdrawal schedules eliminated or netted out to zero by substitution of deliveries in other contracts. When this occurs, a contract-by-contract analysis is required to determine the resultant net uranium demand. Basically, the AFC contract has created the need for continuing and systematic review of enrichment contracts in order to calculate demand for enrichment, conversion and U_3O_8.

Situations can also arise under other contracts where significant changes in demand can occur due to contract adjustments on a one-time basis. Contracts in litigation are one example that is seen frequently in the United States. Another example involving EURODIF is included in Section 8.3.

A more recent development that affects both types of demand forecasts is the trend by uranium purchasing organizations to maintain the deliberate inventories of nuclear fuel which were described in the preceding sections. As such, when the desired (or perhaps minimum) inventory level exceeds the actual inventory level, a demand is created. Thus, actual and projected inventory levels and their underlying policies are becoming increasingly important in projections of total uranium demand. Conversely the shape of future demand and supply are both affected if a utility which holds excess inventories at present plans to "work them off" in the future.

The remainder of this section looks at the different methods of calculating uranium demand, and presents a model to include the demand associated with inventory policies into overall uranium demand forecasts.

8.2 Demand Based Upon Reactor Requirements

Once the nuclear capacity planned to be installed over time is calculated (the GWe profile), it is possible to calculate basic demand numbers. Specific fuel cycle characteristics for each reactor are determined by the reactor loadings, the assay of the enriched fuel loaded into the reactor at each refueling, and the burn-ups, capacity factors and cycle times which determine the length of time between refuelings. Knowing these factors enables one to define the quantities of each step in the fuel cycle (U_3O_8, conversion, enrichment, fabrication) which correspond to reactor requirements.

Next, by knowing the lead times between each step in the fuel cycle, one can then properly position through time the appropriate demand numbers for each step of the fuel cycle. This method has been traditionally used for calculating demand--working backwards from reactor operation dates to fabrication, to enrichment, to conversion, and finally to natural uranium or U_3O_8. It can be utilized to calculate the demands for each step of the fuel cycle for each single reactor, and the reactor requirements can then be summarized for each utility owner, each country, each region, and for the world. This process is graphically illustrated in Figure 8.2.1 below. In this figure the demand calculated is a theoretical demand based upon reactor requirements only in an idealized world, and does not include any adjustments for inventories or actual contract commitments.

Figure 8.2.1

How the Nuclear Profile Sets the Demand Profile*

The Nuclear Profile

- GWe
- Loadings (KgU)
- w/o Enriched product
- w/o Tails
- Burnups
- Specific power
- Capacity factors
- Cycle times
- Fuel cycle lead times

The Demand Profile

Fabrication (KgU)
↓
Enrichment (SWU)
↓
Conversion (KgU as UF_6 or lbs UO_2)
↓
Natural Uranium (lbs U_3O_8)

Once the GWe projection and standard lead times are known, one can calculate the demand for each step in the fuel cycle. For years this was the standard approach used by analysts to calculate demand, and this technique still is used today for macroscopic, long-term planning by almost everyone and for short-to-intermediate-term planning in less sophisticated analyses. However, stating that a demand for a commodity at a given step in the fuel cycle is based upon reactor requirements only is another way of saying that no consideration is given to either:

- demand associated with inventory policies,
- the actual demand on suppliers based upon purchase contracts
- demand associated with changing enrichment contracts .

The result is a less than accurate picture of demand.

8.3 Demand Based Upon Actual Contract Commitments

There is another kind of demand which exists in the marketplace--that is the demand based upon the actual purchase contract commitments of the buyers. The advent of more rigid contracts in 1974-1975 forced more take-and-pay type conditions on the buyers than were common in the earlier era of the Requirements-type contract. Inventories began to build up based on locked-in deliveries under these contracts rather than based upon the reactors' operating schedules.

In theory, demand based upon the actual purchase contract commitments of the buyers should be considered as the most real of the various types of demand. Here, the demand is based upon actual legal instruments --sales/purchase contracts, the summation of which comprises the market-place itself. However, what is true in theory is not always true in fact. DOE introduced the Adjustable, Fixed-Commitment contract in 1978 and pressure forcing the build-up inventories (and thus bolstering uranium demand) was considerably relieved. In the process, however, the stage was set for continual contract adjustments through assignment and pooling of contracts as long as significant reactor construction delays persist. Thus, in the future demand projections based upon contract commitments will require periodic and continuing review of individual contracts to identify only those commitments which will representment real demand.

Another extreme example of the disappearance of uranium demand indicated by contractual commitments is the recent "Italian tails" transaction. Italy is very dependent on imported oil. After the OPEC price increase of 1973 and subsequent Arab oil embargo, the decision was made in Italy to shift massively to nuclear power. As a result, during 1973-75, Italy committed to purchase large blocks of enriching services from EURODIF (in which it took a 25% share), Techsnabexport and the United States. A summary is presented in Table 8.3.1 on the following page.

TABLE 8.3.1

Italy's SWU Commitments to 1990

Enrichment Supplier	By 1990 # Reactors Planned*	By 1990 Capacity (MWe)	SWU Under Contract
EURODIF	12	11,000	29.4 million
Techsnabexport	3	2,800	4.2
DOE	3	1,300	0.7
Total Supply	18	15,300*	34.3
Less firm requirements at start of 1980	8	6,100	8.9
1990 Inventory			25.4 million SWU's

* Plus 2 reactors totaling 186 MWe which do not use enriched uranium.

The 25.4 million SWU's in inventory would represent a 38-year inventory for the eight reactors. If held at a nominal 2.6 w/o, the inventory would comprise approximately 7.4 million KgU of enriched uranium. The resultant U_3O_8 demand would represent approximately 45,000 ST U_3O_8 in the period 1980-1990. In 1990 values, the inventory could cost $US10 billion.

A vice-president at ENEL, the Italian electric utility, formulated an ingenious plan to reduce their inventory while fulfilling their commitment to EURODIF. In 1980 ENEL contracted to purchase 20,000 MTU of tails material from DOE to be enriched in stages at EURODIF. ENEL would essentially use up its EURODIF SWU's making natural UF_6. The net effect of this plan on the uranium market is a greatly reduced market for U_3O_8 in Western Europe than that would otherwise have been expected by uranium producers. ENEL had not bought any natural uranium, so if the plan had not worked, ENEL alone would have been a very major buyer in the market in 1979-85 for approximately 10,000 MTU of feed (26 million pounds U_3O_8). That U_3O_8 demand, once based upon <u>actual contract commitments</u> for enrichment, was eliminated with the stroke of a pen.

8.4 A More Realistic Definition of Demand (and Supply)

A third type of demand and a more accurate representation of reality, is based upon a combination of contractual commitments and reactor requirements taking into account the inventory policies of the buying organizations. By knowing what are the desired, minimum and maximum inventories that organizations intend to carry as a matter of policy over time, the analyst can add these levels of demand for (or supply from) inventory to the demand (supply) values calculated based upon the contract commitments and reactor requirements. A simple model for prediction of inventory levels is presented in the following subsection.

To provide strategic protection for perceived weak links in individual supply streams, many utilities have developed inventory strategies for each step in the fuel cycle. In order to properly calculate demand, the analyst must now know at each step in the fuel cycle where each utility has an inventory policy that differs from the policies for other steps. Knowing what the differences are, it is then necessary to know, on a utility-by-utility basis, how and when those differences will ultimately be resolved. What we find is that it is the inventory policies themselves that provide one ameliorating link between the theoretical demand based upon reactor requirements and the more practical demand based upon actual purchase contracts.

Where an inadvertent inventory has not created stockpile problems and where a utility's criteria for minimum inventory is not being satisfied from existing contracts, a demand exists based solely upon the need to build inventory. This kind of demand actually occurred for buyers in Japan, Korea and Taiwan in 1978, and the resulting market actions of purchasing worked to support the spot market price for uranium in that year.

Where an inadvertent supply to inventory has created stockpile levels that threaten to significantly exceed an organization's maximum criteria, a possible market action involving disposition can be postulated. This market action can take the form of contract reductions, cancellations or sales of inventory into the market.

With the record high costs of money in 1979-1980, electric utilities disposed of excess inventory by offering it for sale in the spot market. Whether directly or indirectly related to the high interest costs and selling, it can be noted that the spot market price dropped 25% in six months. The major buyers, as it turned out, were U.S. uranium producers who were purchasing rather than producing to fulfil sales commitments under older existing higher-priced sales contracts. Once having made the decision to buy rather than produce, producers would logically negotiate as low a purchase price as possible in order to maximize the profits from the resale. The net overall result was a cutback in the U_3O_8 production capability of the United States. The effect on the long-term stability of the U.S. industry is not clear as of the publication of this report.

8.5 Quantitative Application of the Nuclear Fuel Inventory Data

The data collected for this report may be used to estimate the amount of material required to fill inventory requirements on any level from a reactor to a global basis. This section presents an analytical model developed by NRI to predict inventory levels during the period 1980 to 1990. The required inputs for the model are the region (or regions) affected and the nuclear capacity of the designated entities.

As mentioned earlier in the report, this analysis is, to the best of our knowledge, the first of its kind. It should be noted that while the data represent approximately 60% of the nuclear capacity projected for 1990, they encompass only a minority of the total number of utilities and fuel companies in the nuclear industry. As a result, two basic assumptions are required to perform the analysis. These assumptions are:

(1) While the sample space is relatively small, it was assumed for illustrative purposes only that the data are statistically significant. Any serious application of this model would require verification of some existing data and collection of data from many of the organizations not included in the study.

(2) Often in the collection of the data, an organization's inventory policy development would have advanced to the point of identifying desired or maximum or minimum inventory levels, but very rarely could the policy be stated in terms of all three.* Thus, a set of assumptions are necessary to allow consistency for comparisons among the three catagories. These assumptions in order of precedence are:

- if no minimum policy exists for a fuel form, then the minimum coverage assumed for that form is zero.
- if no desired policy exists for a fuel form, then the desired coverage assumed for that form was the minimum level.
- if no maximum policy exists for a fuel form, then the maximum coverage assumed for that form was the desired level.

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* It should be noted, however, that in every organization included in this model, at least one of the categories existed in the corporate inventory policy.

The effect of the second assumption is not as apparent as the first assumption. In the data presented earlier in Sections 3, 4, 5, and 6, the number of companies included in each category varied according to whether or not a policy existed for that category. For example, in Europe, the following data was presented for U_3O_8:

Category	Number of Companies with Policy
Maximum	3
Desired	7
Minimum	4

To allow direct comparison between categories, all seven companies with desired levels must be assigned maximum and minimum policies where they do not exist.

Using the above assumptions, the raw data was normalized to provide the amounts of coverage presented in Table 8.5.1 following. Note that this technique allows comparison between categories in the context discussed above. But that type of comparison should not be attempted for the raw data in the previous sections. A second round of discussions with the Phase I organizations would be required to identify the missing data necessary to allow such a direct comparison of responses.

TABLE 8.5.1

Aggregate Coverage of Nuclear Fuel Inventories

In Terms of Months of Equivalent U_3O_8

(based on model assumptions)

Region	Form	Months of Coverage: Maximum (1980/1985/1990)	Desired (1980/1985/1990)	Minimum (1980/1985/1990)
Eastern Asia	Fabricated Fuel	16.1/15.1/15.7	13.8/13.4/12.6	5.8/ 4.3/ 4.4
	Enriched UF_6	17.3/17.9/17.1	12.0/12.0/12.0	6.7/ 5.1/ 5.0
	Natural UF_6/UO_2	-0-	-0-	-0-
	U_3O_8	24.1/22.8/22.3	22.6/21.3/18.4	6.2/ 3.9/12.8
TOTAL (months of equivalent U_3O_8)		57.5/55.8/55.1	48.4/46.7/43.0	18.7/13.3/12.8
Europe	Fabricated Fuel	3.5/ 3.3/ 3.3	3.3/ 3.2/ 3.2	0.9/ 0.9/ 0.9
	Enriched UF_6	7.6/ 7.6/ 7.6	7.6/ 7.6/ 7.6	1.9/ 1.7/ 1.6
	Natural UF_6/UO_2	-0-	-0-	-0-
	U_3O_8	20.1/18.4/16.8	18.0/17.3/16.2	7.3/ 6.3/ 6.6
TOTAL (months of equivalent U_3O_8)		31.2/29.3/27.7	28.9/28.1/27.0	10.1/ 8.9/ 9.1
North America	Fabricated Fuel	12.7/12.8/12.7	10.5/10.4/10.5	4.2/ 4.5/ 4.4
	Enriched UF_6	-0-	-0-	-0-
	Natural UF_6/UO_2	4.2/ 4.8/ 5.2	3.8/ 4.0/ 4.2	0.9/ 1.7/ 1.1
	U_3O_8	9.8/ 9.5/ 9.1	9.4/ 9.1/ 8.8	0.6/ 0.7/ 0.6
TOTAL (months of equivalent U_3O_8)		26.7/27.1/27.0	23.7/23.5/23.5	5.7/ 6.9/ 6.1

8.6 Model Algorithms

The inventory model actually has two algorithms for determining uranium inventory requirements. The difference between the algorithms is related to the scope of study (i.e. reactor/utility vs. regional/global). More specifically, the difference arises from the interpretation of data presented in Table 8.6.1 below.

TABLE 8.6.1
Probability of Occurrence of Inventory Policies
(Based on Installed Nuclear Capacity)

Form	Probability (%) Eastern Asia	Europe	North America
Fabricated Fuel	85	70	39
Enriched UF_6	74	73	0
Natural UF_6/UO_2	0	0	57
U_3O_8	95	34	66

These data estimate the probability of occurrence of a desired inventory policy within each region based on the fraction of installed nuclear capacity reflected in inventory policies. While it may be expected that these data should represent an appropriate mix of maximum, desired and minimum inventory level policies, the data on desired levels was chosen for two reasons:

- Most utilities with a maximum or minimum inventory level policy had a desired level policy.

- The general model assumes the existence of a policy for all three inventory levels within an organization that has a policy for any one level. The fraction of utilities or organizations indicating a desired inventory level policy in Phase I best reflects this condition.

Thus, the use of the data for desired inventory level policies in Table 8.6.1 is consistent with the general assumptions of the model. However, verification and collection of additional data in Phase II would remove the basic assumption required by this approach.

If the scope of the study is on a reactor/utility level, it is necessary to test for inclusion of the utility in the set of utilities that have inventory policies in that region. If, however, the analysis requires predicting inventory levels for a region, then it is only necessary to weight the amount of inventory coverages in that region by the appropriate probabilities. The input required is the same for each case. The region(s) of interest and the associated nuclear generating capacity program must be specified. Optional inputs such as capacity factors, reactor mix, standard reactor uranium requirements, etc. may be specified to override default values designed into the model. Each of these cases will be discussed separately in this section.

8.7 Reactor/Utility Case

The probabilities identified in Table 8.6.1 preceding are denoted by $P_{i,j}$ where i = 1 to 4 represents the fuel form (e.g. 1 = fabricated fuel; 2 = enriched UF_6; 3 = natural UF_6/UO_2; 4 = U_3O_8) and j = 1 to 3 represents the region. Thus, if j = 1 corresponds to Eastern Asia, then $P_{3,1}$ is the probability that an Eastern Asian utility possesses an inventory policy for natural UF_6/UO_2.

In applying these probabilities to a case where a utility represents only a small part of the region, it is desirable to determine the forms of fuel, if any, that the utility can statistically be expected to carry as inventory. The algorithm calls for random prediction of the existence of inventory policies for each fuel form based on their possibility of existence from this study.

The final step in the forecast is to determine the demand for material of each fuel form to be inventoried within the region. The additional information required for this calculation is:

L_i = lead time required from U_3O_8 delivery to the i^{th} stage in the fuel cycle (where i is the same as defined above)

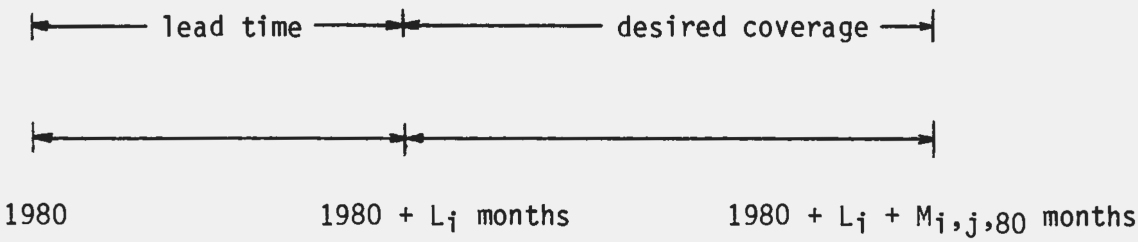
$M_{i,j,k}$ = average weighted months of coverage for inventory of form i in region j and year k.

The amounts of coverage as denoted by $M_{i,j,k}$ were presented in Table 8.5.1 for three years: 1980, 1985 and 1990. The data represent the months of forward coverage desired by organizations in each region. Figure 8.7.1 following shows the time considerations involved in determining the amount of U_3O_8 which must be purchased in 1980 to satisfy the requirement for inventories of each fuel form.

Figure 8.7.1

Inventory Demand Model - Time Considerations

(For the Year 1980)



The figure simply illustrates that taking into consideration the appropriate lead time for delivery of the material L_i, the organization must purchase the U_3O_8 equivalent of $M_{i,j,80}$ months of coverage in 1980 based on the installed nuclear capacity in the year 1980 + $(L_i + M_{i,j,k})$ [months].

The demand for inventoried material can now be calculated for those fuel forms for which an inventory policy exists. Since the demand in a particular year can fall in a 12 month range, it is necessary to calculate the weighted average installed capacity ($MW_{pt.}$) corresponding to the time point estimate of the year of purchase plus $L_i + M_{i,j,k}$ months. The demand for U_3O_8 for an entity in region j based on an inventory requirement in year k is then given by:

$$S_k = K \cdot MW_{pt.} \cdot M_{i,j,k} \qquad i= 1,4$$

where

S_k = amount of U_3O_8 to be purchased for inventory

K = annual U_3O_8 requirement per MWe

$MW_{pt.}$ = point estimate of the installed nuclear capacity for the organization

and

$M_{i,j,k}$ = months of inventory coverage as described above.

NRI applied this model to the organizations visited in Europe during Phase I to illustrate the procedure and allow comparisons between this microscopic approach and the macroscopic approach which is presented in Section 8.8.1. The results of the microscopic model are presented in Table 8.7.1 on the following page.

TABLE 8.7.1

Predicted Purchase Requirements For Inventory - Utility Model

($ST\ U_3O_8$ Equivalent)

Europe

Organization	1980		1985		1990
			St. U_3O_8 Equivalent		
A	350		350		700
B	250		850		850
C	1000		2150		3050
D	450		450		400
E	3700		10200		14200
F	1900		4350		6400
G	3000		3700		3550
H	100		100		450
O	2400		2450		4650
Total	13150		24600		34250
Change		+11450		+9650	

The model predicts the amount of material necessary in a given year for maintaining the desired inventory level. However, the inventory on hand must be accounted for. Thus, the amount of material to be purchased in a period is the difference between the predictions for the endpoints of the period. In Table 8.7.1 above, in order to fulfill the desired inventory levels in 1985, the model predicted that 11450 short tons U_3O_8 must be purchased between 1980 and 1985 for the 9 organizations involved. Between 1985 and 1990 some 9650 short tons U_3O_8 must be purchased.

8.8 Regional/Global Case

In the case where U_3O_8 demand (including inventory requirements) is calculated on a macroscopic basis (i.e. regional or multi-regional), the model presented in Section 8.5.2 is simplified. The determination of inventory policy existence is no longer required since on a regional average, the amount of coverage can be found by multiplying the probabilities in Table 8.6.1 by the months of coverage of the appropriate fuel form from Table 8.5.1. The formula for the demand for U_3O_8 in region j, based on an inventory requirement in year k is given by:

$$P_{,k} = K \cdot MW_{pt.} \cdot P_{i,j} \cdot M_{i,j,k} \qquad i = 1,4$$

where the variables are the same as described in Section 8.5.2

A regional calculation for the Phase I organizations in Europe was performed to allow comparison to the predictions presented in the previous subsection. In this case, the total purchase requirements are given in Table 8.8.1 below:

TABLE 8.8.1

Predicted Purchase Requirements for Inventory - Regional Model

($St\ U_3O_8$ equivalent)

Europe

Year	1980		1985		1990
Total Purchase Requirements	11500		19800		28350
Change		+8300		+8550	

These annual requirements are 13%-20% below the predictions in Section 8.7. The main reason for this difference is the development of the rough probabilities of Table 8.5.1 based on data gathered from only a relatively few organizations. Consequently the standard deviations for the model are quite large. The collection of more data from the remaining organizations in Phase II will improve these statistics significantly.

SECTION 9

OBSERVATIONS AND CONCLUSIONS

9.1 Observations

Every one of the twenty participants in the study had by 1980 developed a deliberate corporate policy to hold certain desired levels of nuclear fuel inventories. In most cases the actual 1980 levels of inventories exceeded those levels which were desired to be held.

Most of the inventories that have developed to date have occurred inadvertantly. As reactor projects have been delayed and cancelled around the world during the period 1975-1980, the lack of concomitant relief from previously executed fuel supply purchase contracts has created current excess inventories. These excess inventories will continue to grow inadvertantly until the latter half of the decade of the 1980's.

Although every study participant had developed some policy for desired levels of inventory, not many had done much in-depth thinking about minimum or maximum levels, about disposition of excesses, or how their policies would change from 1980 to 1985 to 1990. Thirty-five percent of respondents had not established any policy at all for maximum levels for any form of fuel.

The forms of fuel which individual participants in the study chose to carry included U_3O_8, natural UF_6, enriched UF_6 and fabricated fuel assemblies. Each organization established its desired level of each form based upon the risks which it perceived to its supplies.

A definite pattern can be seen in the choice of forms. In countries in which there are no fuel fabrication facilities (Finland, Switzerland) utilities choose to carry a strategic inventory of fabricated fuel assemblies enough for at least one year of operation of the reactors. This is the most expensive form of inventory to carry but also the most effective for both strategic and tactical applications. In general, where a fuel fabrication facility exists in a country (England, France, Germany, United States), the preference is to carry fuel in the next lower economic form as enriched UF_6.

In every country, regardless of the specific policies on enriched UF_6 or fabricated fuel, there is a clear concern about assuring U_3O_8 supplies. Fully 18 of the 20 respondents have a policy for maintaining an inventory of U_3O_8, or the next upgraded form of UF_6, over and above any inventory of enriched/fabricated fuel.

There are differences among countries in terms of the organization responsible for fuel supply at the various steps in the fuel cycle, and also which organization is responsible for maintaining nuclear fuel inventories. Some countries (England, France, Spain, Sweden) have national supply agent organizations which are responsible for contracting for uranium, conversion and enrichment. The utilities contract directly only for fabrication and with the national agent for the enriched UF_6. The supply agents carry the inventory for the forms for which they are responsible and the utilities carry the fabricated fuel inventories. In these cases, the supply agents will often try to talk the utilities into carrying larger inventories of fabricated fuel so as to remove excess enriched UF_6, natural UF_6 and U_3O_8 off the books of the supply agents.

In Canada, Finland, Japan, Germany, Korea, the Philippines, Switzerland and the United States, the utilities themselves contract directly for all forms of fuel and carry the inventories. The utility companies in the study in Finland, Germany, Japan, Switzerland and the United States (except for TVA) are private companies. In Canada, England, France, Korea and the Philippines the utilities are actually government agencies or corporations. The study showed that the types and levels of inventories maintained by utilities is not at all a function of whether the utility is a private or government entity. The types and levels of inventories maintained by an organization are much more a function of the degree of import dependence, the cost of money, and the nationality, nature, historical performance and expected future reliability of specific supply sources under contract to that organization.

As might be expected, there is a clear pattern that the higher the cost of money is to an organization, the lower the levels of inventory that organization desires to maintain. Higher interest rates or otherwise increasing costs of money can affect an organization's policy, reducing the desired and maximum levels of inventory and triggering disposition of inventories into the marketplace. This effect clearly existed in the United States at the end of 1979 and first half of 1980 as utilities began to sell off excess U_3O_8 from inventories under the pressure of record high interest rates.

A clear pattern also exists concerning import dependence. Those countries which are most vulnerable to external supply disruptions maintain the largest inventories, and those less vulnerable, lower inventories. The United States utilities have the lowest desired level of any utilities in the world. This is so because the U.S. is internally self-sufficient at all steps of the fuel cycle, so U.S. utilities are less concerned about disruptions of a political nature. The U.S. utility is, however, more vulnerable to litigation-based interruptions. U.S. utilities have for years loaned and borrowed uranium among themselves to offset tactical type disruptions.

The U.S. utilities have a predominance of Requirements-type enrichment contracts with USDOE. In fact, 80% of all enrichment contracts supplying U.S. utilities up through 1980 are DOE's Requirements contract. This particular form of contract enables a utility to absolutely minimize unwanted excess inventories of enriched UF_6. Therefore, the U.S. utilities can concentrate on restricting excess U_3O_8 and natural UF_6 inventories, without having enrichment as a "driver" of uranium demand.

Those utilities with the more restrictive forms of enrichment contracts with USDOE, EURODIF and Techsnabexport consider that it is the enrichment contracts which "drive" or determine their uranium demand, and to a major extent the level of their inadvertant inventories. On the other hand, utilities with Requirements-type contracts with USDOE and Urenco consider it is the nuclear plant schedule (the Gwe profile) that drives their uranium demand. This finding confirms the necessity to take specific enrichment contracts into account in performing uranium supply/demand forecasts.

No organization is this study reported that their inventory policy would be modified if the enrichers themselves maintained inventories.

Another pattern that came out of the study concerned the techniques of inventory reduction. The non-U.S. organizations almost exclusively had a policy of not selling excess U_3O_8 into the marketplace. A number of organizations would be pleased, however, if they could sell excess enrichment services, or as a last resort, excess enriched UF_6. Only U.S. utilities included sales of excess U_3O_8 as part of their policy for reducing inventories. For the buyers outside the U.S., the main technique for inventory reductions is the maximum use of all the flexibility provisions incorporated in each supply contract. In the U.S. and to a lesser extent among the utilities around the world, the fuel managers have become quite adept at administering their AFC and Requirements contracts to minimize excess inventories of enriched UF_6. This appreciation for the flexibility provisions of enrichment contracts can be expected to also make itself evident in new uranium contracts, particularly during periods of a "buyers" market.

One of the more unusual findings of the study concerned storage locations. The study showed that the main concern of consumers was disruption of supplies due to political reasons or events. It is for this undesired eventuality that deliberate strategic inventories are maintained. This would imply that the strategic inventories, when maintained, would be held at storage locations within one's national boundaries. However, the study found that that is not the case. Some of the largest holders of inventory have that inventory scattered all over the world. For example, neither Japan nor Spain have licensed storage facilities for anything other than fabricated fuel. Japanese utilities have years worth of U_3O_8 and or natural UF_6 stored in Canada, Niger, South Africa, England, France, and the United States. A number of consumers in other countries similarly have their inventories dispersed and beyond their immediate national control.

There is a dependence, and to a certain degree a kind of blind trust, that the world trade system will hold together, and that nations who are friendly and reliable suppliers today will remain so. There is very little interest, except among the smaller utilities in the lesser industrialized countries, for an INFCE-type fuel bank or for other alternative inventory schemes.

Japan's placement of inventory all around the world is one example of its trust that traditional trade relations will be preserved. Another example is Korea's election to keep minimum inventories. This decision is based on Korea's trust in the relationship with the United States. If that relationship fails, the ramifications are so great that an inventory for one or two years has little meaning. So with that as background, the economic consideration becomes predominant and inventories are held to a minimum.

9.2 Conclusions

For Phase II, NRI has several recommendations:

- Additional time and effort should be spent to collect data from several sources within each country. This will permit more specific descriptions of the policies operative within individual countries. By collecting input data from several sources, the output data can be aggregated, a clear description of national policies can emerge, and requests for confidentiality of discrete data can still be preserved.

- Additional attention should be paid to the sensitivity of inventory policies to possible changes in the economic environment and particularly to the effects in different countries of changes in the interest rates and currency exchange rates.

As this initial report has demonstrated, it is possible to collect information on the inventory management policies of electric utilities around the world in sufficient detail to permit meaningful analysis. In our opinion, the feasibility test which was one of the purposes of the study has been passed.

The results show that data of both a qualitative and quantitative nature can be collected. The quantitative data, particularly on minimum and maximum criteria, should, after several annual repetitions, become an increasingly rich source for analysis. Even with the limited data from the relatively small sample size of Phase I, it is possible to predict and/or confirm some market actions.

The study demonstrated that it is possible to perform more rigorous analyses of demand than heretofore possible by incorporation of actual inventory dynamics.

NRI hopes that the results of the study will enhance the abilities of the U.S. Departments of Energy and State to make positive contributions in future international discussions on inventories, in their studies of alternative supply assurance mechanisms, and in their analyses of the domestic and international markets for uranium and enrichment services.

NOTES

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File Energy

The Impact of Accelerated Motor Gasoline Decontrol on Independent Marketers

by

Michael T. Scanlon, Jr.

December 2, 1980

POLICY RECOMMENDATIONS

Submitted to:

The Office of the President-elect

Domestic Policy Staff

DEC 3 1980

EXECUTIVE SUMMARY:

The independent segment of the petroleum marketing industry sells eight of every ten gallons of motor gasoline marketed in the United States. The largest group within the independent segment is the gasoline jobbers who account for a 48% market share of the national total. More than 90% of jobbers are classified as small businesses by the U.S. Small Business Administration. Gasoline jobbers are estimated to serve some 100 million American consumers with motor gasoline and other petroleum products, including 90% of all the agricultural fuels consumed in the nation.

Nearly ten years of federal government pricing and allocation controls have driven more than 7,000 jobbers and thousands more small business marketers out of business. Those small businessmen who remain are undergoing a severe cash flow crisis brought about by a combination of government regulations, rising costs, high interest rates and previous shortages. Forty-two (42) percent of gasoline jobbers suffered a negative cash flow during calendar 1979.

Independent small business jobbers and marketers are concerned about a presidential decision to accelerate the motor gasoline decontrol schedule. The specific concerns relate to: access to supply, contract terminations, market withdrawals by refiners and changes in refiner business & credit practices. The fear is that a tidal wave of drastic changes following an immediate decontrol action would wipe out many small marketers due to their precarious financial position and that American consumers would be left without adequate gasoline supplies.

This paper outlines the major areas of concern, the reasons for the concerns and policy recommendations which should be considered in arriving at a decision to decontrol motor gasoline prior to October 1, 1981.

The recommendations include instituting a reasonable transition period by utilizing the influence of the Office of the Presidency to bring together all segments of the petroleum industry to implement requirements designed to return the industry to the free marketplace after a decade of federal government controls. The requirements include adequate notice provisions which would allow small business marketers to adjust to a decontrolled environment while allowing refining companies the flexibility to distribute unobligated gasoline product to those areas where demand has increased.

Provided that an accelerated presidential decontrol action take place in a period of adequate gasoline supply, the recommendations would protect the competitive viability of the independent small business segment of the petroleum marketing industry to the benefit of the American consumer.

The Independent Marketing Segment of the Petroleum Industry

The independent segment of the petroleum marketing industry is comprised of four basic groups: (i.) independent & small refining companies marketing through their own retail outlets, (ii.) service station dealers, (iii.) chain retailers, and (iv.) gasoline jobbers.

The largest of these groups, in terms of market share, is the gasoline jobbers. According to the Lundberg Letter, an authoritative petroleum industry source, gasoline jobbers accounted for 48 percent of motor gasoline volumes sold in the United States during 1979. There is a universe of some 24,300 independent jobbers and commissioned agents. The only difference between a jobber and an agent is that the former takes title to product at the refinery; the latter operates on a commission fee basis. More than 90 percent of these independent petroleum marketers are classified as small businesses by the U.S. Small Business Administration (SBA).

Thus, from the standpoint of the impact of motor gasoline decontrol, it is appropriate to assess how such an action would affect this huge segment of the petroleum marketing industry and the millions of consumers served by gasoline jobbers.

It is important to note that the independent small business jobbers market four times more motor gasoline than do the major refiners. For example in 1979, refiner salary-operated retail outlets sold 13.3 billion gallons of gasoline for a 12 percent share of the national market. Compare this to the jobber share of 48 percent. When small business marketers, jobbers and service station dealers (with a 34.7% share), are combined their total volume equals 91.6 billion gallons (1979). Jobbers are estimated to serve some 100 million American consumers with motor gasoline and other petroleum products.

In order to better assess the potential impact of motor gasoline decontrol on independent marketers, it is vital to know what a gasoline jobber is, and what functions are performed by this vital link to the consumer. The typical jobber performs both a wholesale and a retail function in the distribution of motor gasoline. The wholesale function begins with the acquisition of product, usually at a refinery terminal. From the terminal jobbers transport the gasoline, store it at their own bulk plants, extend credit to their customers and then distribute the product to a variety of wholesale accounts.

The retail function of jobbers includes the ownership of one or more service stations or retail outlets, the management of his own salary-operated outlet(s), and sales of motor fuels to farms, ranches, local governments, other small businesses and the consuming public. Gasoline jobbers employ from 15 to 100 full-time persons in their offices, at bulk plants, in transporting product and in their service stations. Each gasoline jobbership serves some 3 to 4 million American consumers.

Jobbers market motor gasoline either under the trademark of their refiner-supplier or under their own private trade name. When marketing under the trademark of their refiner, the jobber is termed to be a "branded" marketer; when marketing under a private trade name, the jobber is termed to be an "unbranded" marketer. In addition to gasoline, diesel fuel and some home heating fuel, jobbers also market a variety of other petroleum products and accessories.

A Decade of Federal Government Controls

The entire petroleum marketing industry has suffered under federal controls for nearly ten years. Price controls were first placed on motor gasoline in 1971; this was followed in 1973 by allocation controls in the wake of the Arab oil embargo. According to the U.S. Department of Energy (Office of Regulations), some 7,000 jobberships suffered financial failure during the ten years of price and allocation regulation. The DOE further stated that the controls themselves were a major factor in the demise of most of these small businesses.

Prior to the federal government controls jobbers were able to shop among many different refiners in securing a source of gasoline supply. This shopping kept refinery supply contracts and terms competitive. However, with the imposition of price and allocation controls, refiners were more restricted and less willing to take on jobbers as new customers. The controls had the effect of freezing refiner supply obligations and credit terms.

In order to understand fully the impact of motor gasoline decontrol upon jobbers, it is important to know how the controls period has negatively affected the financial structure of those small businesses involved in marketing.

The decade of federal pricing and allocation controls has frozen the gasoline marketplace. Those business decisions which refiners and marketers would have made during the decade have not taken place due to the regulations. Supply commitments, market withdrawals, contract terminations and credit practice changes are four areas where the industry has been severely restricted. These four subject areas are now the major concerns of the small business segment of the industry.

Perhaps the major concern with regard to decontrol is that the federal floodgates, which have dammed up all these refiner decisions, will all be opened in one sudden action. The fear is that the "tidal wave" of drastic changes in supplies, marketing priorities, contract volumes and credit terms following an immediate decontrol action will wipe out many small marketers and adversely affect many customers.

It is probable that many inefficient marketers have been kept in business by the strict federal controls. However, it is the assumption of many industry observers that most of these inefficient marketers will leave the business following controls. The primary concern among small businessmen is that a sudden motor gasoline decontrol action would unnecessarily injure many efficient marketers and their customers, due to hasty and arbitrary refiner marketing decisions.

The passage of the Petroleum Marketing Practices Act (PMPA) in 1978 was expected to prevent many of these small business failures. The act was designed to establish certain criteria for refiner decisions as to supply commitments, market withdrawals and contract terminations following the decontrol of gasoline. Unfortunately, the controls period continued through 1979 and on to the present day. Under the provisions of the PMPA, refiners were obligated to notify marketers of their intention to stop supplying motor fuels to a given geographical area at least six (6) months prior to the action.

Despite these problems created by federal controls a majority of gasoline jobbers and other marketers support the notion of decontrol. However, the same basic majority supporting decontrol would also prefer to undergo a reasonable phase-out transition period from the years of controls to the free marketplace.

<u>The Result of Controls: A Jobber Cash Flow Crisis</u>

Federal government price and allocation controls on motor gasoline have contributed greatly to a severe financial crisis for independent small business jobbers.

The federal price controls were calculated on the notion of a national average jobber margin on a specific base date: May 15, 1973. For example, the average jobber had a four cents-per-gallon margin, over product cost, on gasoline on the base date. Then in 1974 the maximum allowable ceiling price was raised by one cent to an average of five cents-per-gallon. These allowable margins were not reached for some time due to the intense competition within the gasoline marketing industry.

The federal allocation controls mandated that jobbers be supplied by the same refining company, at the same volume levels, as they did business with during a prescribed base period.

Then, when a shortfall of supply occurred, as it did in 1979, refiners were mandated to establish an allocation fraction which was designed so that all customers shared the shortfall on an equal basis.

The financial crisis hit in 1979 when the rising costs of doing business forced most jobbers to their maximum allowable selling prices -- at the same time that the Iranian revolution caused a shortfall in gasoline supplies in the United States. Jobbers were forced, by the allocation regulations, to sell fewer gallons based on allocation fractions, at artificially low prices, mandated by the pricing regulations.

The reasons for the financial crisis were quite obvious and basic. Jobber maximum allowable prices had been fixed at the same five cents-per-gallon figure for more than five long years. During this same five year period the costs of doing business: rents, salaries, insurance, fleet fuels & maintenance and utilities rose anywhere from 50 percent to 150 percent. During 1979 alone, the product cost of gasoline rose by 58 percent; and the cost of financing gasoline inventories (secured at several points over the prime interest rate) more than doubled. Jobber associations estimate that in one four month period, from April to July 1979, some 1,200 jobberships suffered financial failure due to the conflicting pressures of price and supply. A post-mortem analysis of 1979 by jobber associations reported the dire result: 2,000 jobbership failures and 42 per cent of jobbers nationally showing a negative cash flow for the entire year.

One major reason for the 1979 cash flow crisis was credit terms. Traditionally, jobbers must pay their cost of product to the refining companies within 30 days. Many refining companies allow for a "prompt payment discount", a one percent discount if the product is paid for within 10 days of billing. On the other hand, jobbers have traditionally extended credit terms to their customers as follows: to dealers (from 30-60 days); to bulk purchasers (up to 90 days); and, in the case of farm or ranch accounts (from 180 days/or until harvest). This last category is considerable in terms of credit because jobbers supply nationally about 90 percent of agricultural fuels. The above credit terms were locked-in during the 1979 shortfall crisis due to the federal regulations. Thus, the combination of outdated jobber margins, lower allocation fractions, short term accounts payable & long term accounts receivable, rising interest rates at banks and depreciating jobber assets all resulted in a financial disaster for this huge segment of the gasoline marketing industry.

The financial situation of jobbers was so severe that when the Carter Administration unveiled its plans to impose a ten cents-per-gallon Gasoline Conservation Fee in May of 1980 the plan was challenged legally by petroleum marketers. The National Oil Jobbers Council, which represents some 22,000 jobbers and agents, provided the only witness testimony in the federal court proceedings which resulted in a permanent injunction against the implementation of the fee scheme. The influential NOJC testimony centered on the inability of small business jobbers and marketers to sustain the overnight 8 per cent increase in product costs that would have been imposed by the Carter fee. The testimony indicated the severe cash flow situation of the gasoline marketplace due to years of federal controls. Jobbers later used their grass-roots influence to lobby the first presidential veto override of a Democratic president by a Democratic Congress since the time of Harry Truman.

The above cash flow problems of jobbers and other small business petroleum marketers coupled with concerns about supply, refiner market withdrawals, contract terminations and credit terms add up to a wary segment of independent marketers when it comes to talk of an immediate motor gasoline decontrol action.

Decontrol Problem Areas

There are four basic problem areas in the opinion of independent marketers which must be addressed prior to an immediate action to decontrol motor gasoline. Should the Reagan Administration opt to keep motor gasoline on the congressionally framed time schedule, October 1, 1981, the politically influential independent small business petroleum marketers are prepared to introduce legislation to remedy the following four problem areas. Should the new administration opt to accelerate the decontrol timetable, these four areas will likely determine the success or failure of the decision to decontrol early.

(1) Access to Supply

Jobbers and other small business marketers feel they require a reasonable transition period between the years of federal controls and the free marketplace. Several leading refining companies have suggested a one-year transition in terms of access to supply. These refiners would be willing to honor supply commitments for 12 months following decontrol in order to ease the change for small marketers from controls to a free market. A problem arises should one refiner, following an immediate action to decontrol, decide to cut off supply to a specific jobber, that jobber would be unable to secure a replacement source of supply in enough time to remain in business. The result would be a bankrupt jobber and 3-4 million customers without access to adequate supplies of gasoline.

(2) Contract Terminations by a Refiner

Refining companies wishing to terminate the supply contract or government-mandated supply obligation to an individual marketer may do so, under certain conditions, in a period of gasoline decontrol. If the 90 day advance notice conditions of the Petroleum Marketing Practices Act (PMPA) have been fulfilled, refiners could cut off supplies to certain jobbers or marketers upon an immediate decontrol action of the president. Those refining companies wishing to serve as a replacement source of supply may not be able to move swiftly enough after an immediate decontrol action to keep the jobber and his customers in an adequate supply situation.

(3) Market Area Withdrawals by a Refiner

Refining companies wishing to withdraw from marketing in a certain geographical area upon gasoline decontrol, having fulfilled the 6 month notice provision of the PMPA (as far back as 3 years ago), could do so following an immediate decontrol action of the president. Many refiners have already fulfilled the notice provision of PMPA with regard to withdrawals and have announced scheduled pullout dates for the Northern tier of states (from New England to Idaho). The consumer outcry resulting from such overnight pullouts could cause significant political problems for the new administration.

(4) Business Practices Changes by Refiners

Refining companies have been prevented by federal controls from changing business and credit practices to jobbers. An immediate decontrol action by the president could cause sweeping changes in the areas of: brand promotion, prompt payment discounts, hauling allowances, credit card policies and other traditionally extended business practices. Those small business marketers unable to adjust to the cash flow implications of all these sudden changes would be forced out of business. Again, the customers served by these jobberships would be without adequate supplies of motor gasoline.

Despite the serious concerns above there are ways in which the petroleum marketing industry could be brought from controls to a free marketplace with a minimum of economic and supply disruptions for the American consumer, and, with a minimum of danger to the competitive viability of the independent small business segment of the petroleum marketing industry.

The following are several recommendations which should be considered in determining the Reagan Administration's decision as to decontrol of motor gasoline:

Policy Recommendations: Early Motor Gasoline Decontrol

Should the Reagan Administration opt to accelerate the timetable for the scheduled decontrol of motor gasoline the four points below would be generally supported by independent small business petroleum marketers:

These recommendations are premised on the basis that the president has the authority to decontrol motor gasoline in an adequate supply scenario, and, in the knowledge that the competitive viability of the independent small business segment of the petroleum marketing industry would not be adversely affected; that the president has the authority to re-impose federal controls until the expiration of the Emergency Petroleum Allocation Act (EPAA); that the president has other authorities vested in him to impose other sanctions in the event of an energy supply emergency; and, that the president may introduce legislation through the Congress to remedy any problems within the petroleum marketing industry.

Recommendation A: A Transition Period After Decontrol

A transition period, instituted upon an early decontrol action, would allow a time frame within which refiners could provide small business marketers adequate notice of their intention to change marketing strategies and contract terms, and, would allow small business marketers ample time to secure replacement sources of supply for their customers. Refining companies generally would suggest a one-year transition period; jobbers and small marketers would suggest a somewhat longer period. Such a transition period could be brought about in an early decontrol scenario via the influence of the president. A "jawboned" transition period, agreed to by all segments of the petroleum industry with the potential sanctions of the EPAA in place until October of 1981, could be arranged by the new administration.

Recommendation B: Continuance of Current Supply Obligations

A requirement that during the transition period refining companies be obligated to maintain those supply commitments mandated by the existing base period to all classes of customers; a further requirement that any refiner wishing to terminate such commitment at the conclusion of the transition period must provide written notice to the affected customer(s) at least six months prior to the conclusion of the transition period. This recommendation would allow all unobligated gallons to be freely distributed to those areas of increased demand.

Recommendation C: Adequate Notice of Refiner Withdrawals

A requirement that in the event of a refining company decision to withdraw from marketing within a given geographical area at the conclusion of the transition period, the refining company must provide written notice to the Administration, the governor(s) of the affected state(s) and each affected customer at least six months prior to the conclusion of the transition period. This recommendation allows flexibility to all segments of the industry to change marketing strategies within a reasonable period and permits adversely affected marketers and customers adequate time to secure replacement supplies.

Recommendation D: Adequate Notice of Business Practices Changes

A requirement that in the event of a refining company decision to change any traditional business practice extended during the existing base period, the refining company must provide written notice to each affected customer at least six months prior to the effective date of that action; traditional business practices generally include: brand promotion, prompt payment discounts, hauling allowances, credit cards and any other price discounts offered during the existing base period. This recommendation would allow small business marketers a minimum six months notice to arrange for additional financing and to make those business decisions necessary to meet the increased cash flow demands of the refiner's action.

Conclusion:

The above recommendations, based on the recent history of the independent small business petroleum marketer under federal controls, result from a desire on the part of these small businessmen to accept motor gasoline decontrol with reasonable assurances that efficient marketers will be able to continue to serve their customers. The above recommendations, if implemented during a period of adequate supply, will protect the competitive viability of the independent small business segment of the industry and insure equitable treatment for the hundreds of millions of American consumers it serves.

With the exception of continued supply obligations during the proposed transition period, the recommendations merely require adequate notice of supply terminations, market withdrawals and changes in business practices. The recommendations do not freeze refining companies into a continuation of government-mandated marketing strategies. These recommendations will allow flexibility to both refiners and marketers to adjust to free market requirements to the benefit of the American consumer.

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