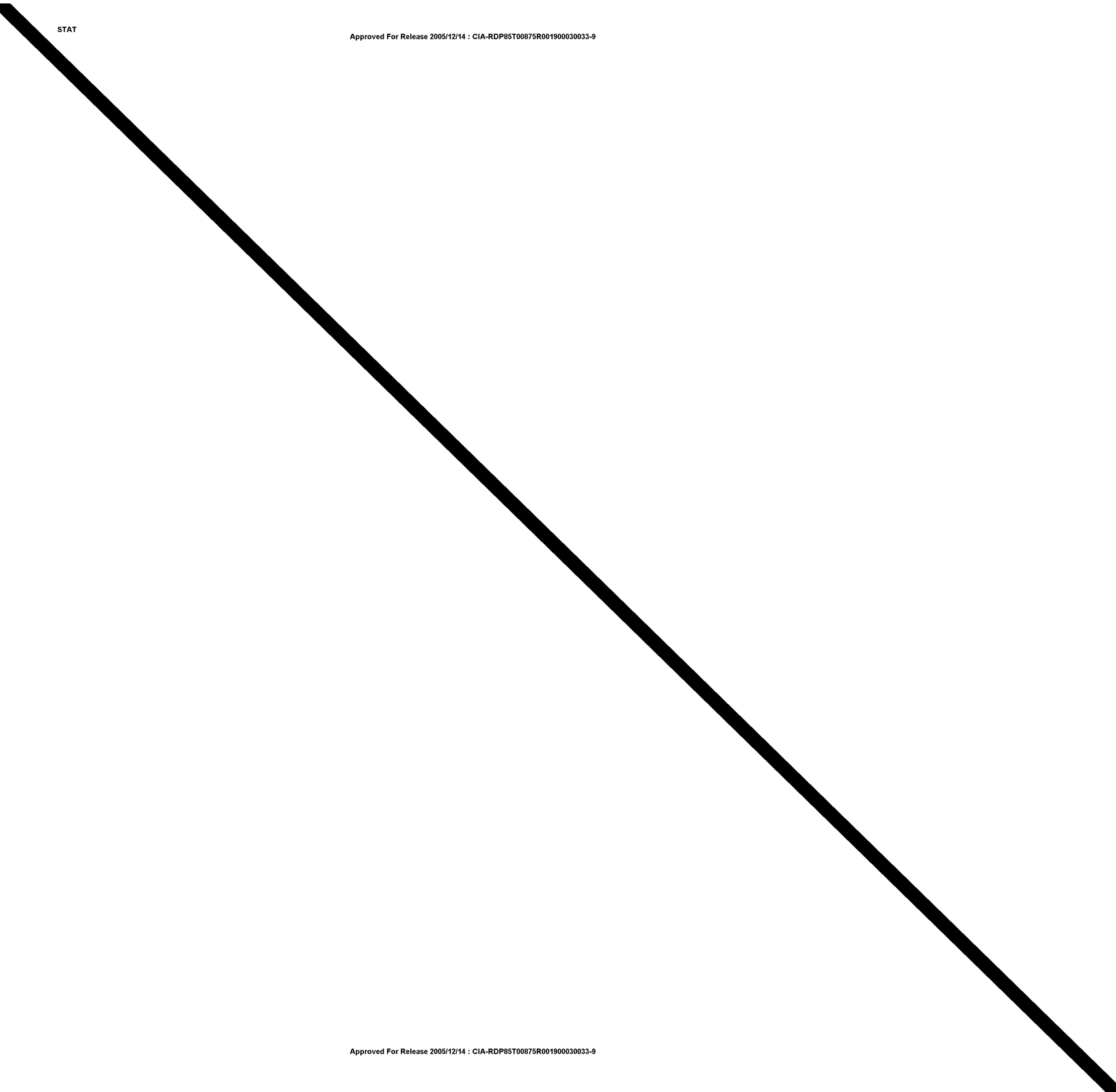

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MEMORANDUM FOR THE RECORD

~~SUBJECT:~~ Distribution of S-6343

TITLE: OIL IMPORTS AND STOCK WITHDRAWALS IMPLIED BY THE IEP

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Oil Imports and Stock Withdrawals Implied by the Integrated Emergency Program

Prepared for

The International Energy Review Group

19 July 1974
CIA/OER

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INTRODUCTION AND KEY JUDGMENTS

1. Chairman Davignon's Note of the Energy Coordinating Group (ECG) Meeting on 8 and 9 July contains the most recent revisions of the Integrated Emergency Program (IEP)--a US proposal for international agreement on oil stocks, demand restraints, and sharing during supply disruptions. The note leaves unanswered two major questions that this report addresses:

-- Under the IEP, how would the US and other members fare during oil embargoes? What imports would the IEP allow, and how long would emergency stocks last?

-- Could the IEP produce results that the ECG had not intended? If so, how could these anomalies be corrected?

2. To answer these questions, we first specify how the IEP determines members' imports and stock withdrawals during crises. We then show how the IEP might have functioned, had various crises occurred in 1973. Finally, to show potential effects of the IEP, we examine embargoes possible in 1980 and 1985. The data base for all our calculations appears in this report's annex.

3. Our major judgments on the IEP are:

-- In virtually all crises, the IEP requires the US to take larger percentage cuts in imports than other members.

-- Except during certain mild crises, all members take the same percentage cut in oil consumption. This does not mean that the IEP specifies sharing on the basis of consumption (where each member reduces his consumption by the same percentage that an embargo reduces the group's consumption).

-- US import shares under the IEP fall between the low shares the US would get under consumption-based sharing, and the high shares the US would get under import-based sharing.

-- Had the US been severely embargoed in 1973, the IEP would have helped. For example, under a selective embargo the US could have lost 60% of its imports, but under the IEP the same embargo would have cost the US an import loss of only 23%.

-- Should the US achieve self-sufficiency in oil production, the IEP would require the US to curtail its oil consumption and export some of its domestic production to other members during crises.

-- If the members agree to maintain emergency oil stocks equal to 90 days of normal imports, then under the IEP the group could now weather severe embargoes, such as a total OAPEC cutoff, for at least seven months. Should OAPEC cut its exports by half, ninety-day stocks would last at least two years. Half of these stocks would last half as long.

-- Davignon's note specifies an IEP sharing plan only for moderate and severe crises. The plan for mild crises remains to be determined. An application of the IEP plan during mild crises would produce anomalous results.

-- These anomalies could be remedied by an alternative sharing plan for mild crises. Each member could absorb his embargo loss, up to a maximum of 5% of his normal consumption. This absorption would reduce the group's supply shortfall, which all members could share on the basis of their reduced levels of consumption.

THE IEP, AS OF 10 JULY 1974

4. Under the IEP, each member's daily oil imports and stock withdrawals during a crisis are based on daily embargo losses. The allowed imports and stock withdrawals are determined differently, depending on whether a crisis is negligible, mild, moderate, or severe.

Imports and Stock Withdrawals During Negligible and Mild Crises

5. In a negligible crisis--when no member's daily loss of oil imports exceeds 5% of his normal daily consumption--the IEP prescribes no sharing and no demand restraints. In such cases, each member deals with the crisis according to his own choice of stock withdrawals and demand restraints.

6. A mild crisis obtains when the import loss to one or more members exceeds 5% of his/their normal daily consumption, and when this loss does not exceed 7% of all IEP members' joint consumption. In this case the IEP requires members whose embargo loss exceeds 5% of normal consumption to cut their oil consumption by 5%. No demand restraints are required for a member whose embargo loss does not exceed 5% of his normal consumption. Regardless of whether a member must restrain his demand by 5%, any target of a selective embargo must absorb his embargo loss up to the 5% limit.

7. This demand reduction decreases the joint embargo loss that all IEP members as a group must absorb through stock withdrawals and sharing. The formulas for these two measures remain to be determined, according to the Chairman's Note. The note does suggest for more severe crises a formula that could be applied, with minor modifications, to mild crises. Applications of this IEP formula produce anomalous results. These could be remedied by a second option for the sharing formula. In detail, the two options (a. and b.) are:

a. Sharing so that all members exhaust their oil stocks at the same time. To specify this formula, we let C denote the members' normal total rate of oil consumption, in millions of barrels per day (mb/d). We also write their total daily production as P mb/d, and their imports during the crisis as I mb/d.

We assume for example that two countries--whose normal consumption rates are c_1 and c_2 mb/d respectively--are required to reduce their consumption by 5%. Then the group's adjusted shortfall S becomes

$$S = (C - .05(c_1 + c_2)) - P - I.$$

This means that the IEP group must draw S mb/d from their stocks so that the two countries consume at 95% of normal, and the rest at 100% of normal.

All members share the shortfall S in proportion to their emergency stocks. If some member had agreed to maintain emergency stocks of t million barrels (mb), and if the members had agreed to maintain collectively a total of T mb in emergency stocks, then the member with t mb in stock would be required to draw d mb/d, where

$$d = (t/T)S.$$

When each depletes his stock at the agreed rate, then each exhausts his stock at the same time.

Each member's stock drawdown obligation partly determines the imports he gets during the crisis. When a member must reduce his total consumption of c mb/d by 5%, then the imports he needs to maintain his consumption at 95% of normal are

$$n = .95c - p,$$

where p is his domestic oil production. The imports he gets under the IEP are

$$i = n - d,$$

where d is his stock drawdown obligation. A member who is not required to reduce his oil consumption gets crisis imports of

$$i = c - p - (t/T)S,$$

where c is his normal consumption, p is his domestic production, t is his emergency stock level, T is the group's stock level, and S is the group's adjusted shortfall.

This formula requires members who are targets of selective embargoes to take the full impact up to 5% of their oil consumption. In this sense the formula distinguishes between targets of an embargo, versus other IEP members.

Some of these non-targets, however, fare better than others during a crisis. Members that normally import no oil would share nothing during a selective embargo, while those who normally import oil would be required to draw down their stocks. This result follows from the fact that the formula specifies a country's agreed emergency oil stock as some number of days times his normal imports. Since his drawdown obligation is in proportion to his stock requirement, a member with no normal imports has no drawdown obligation.

Even among the non-targets who normally import oil, some fare better than others. Of two members with identical rates of oil consumption, one might be required to draw from stocks much more than the other.

A further anomaly of the formula is that its results can negate its premises. For example, if one member's embargo loss is 10% of his consumption, and another's is 4%, then the first member presumably restrains his demand, while the second does not. The second member must give the first some oil, in order to share the first's loss over 5%. In giving the oil, the second effectively increases his embargo loss, perhaps to 6% of his consumption. Thus as a result of sharing, the second should restrain his demand by 5%; but he does not, according to the formula's premise. Should he do so, the group's shortfall would have to be recalculated. His loss of over 5% would then be shared. This process is probably much more complicated the the ECG has intended.

b. Modified sharing on the basis of consumption. We can adjust for the above anomalies by modifying the sharing concept. We assume that an embargoed member absorbs his entire loss, up to a maximum of 5% of his normal consumption. This absorption reduces the group's shortfall, which all members then share on the basis of their restrained levels of consumption.

In detail, this sharing plan begins with a list of percentage reductions in oil consumption that an embargo would force each member to take. Each cut of more than 5% is reduced to 5%, thereby giving a revised list of percentage cuts. If some member's revised percentage cut is r, and if his normal consumption is c mb/d, then we compute his reduced consumption x mb/d as

$$x = (1 - r)\ c.$$

If his normal imports are a mb/d, and if the group's total reduced rate of consumption is X mb/d, and if the group's reduced shortfall is S mb/d, then the sharing plan allows him imports of i mb/d where

$$i = a - (S/X)x.$$

In this calculation, the reduced consumption level x is merely an accounting device. The member's actual crisis consumption is the sum of his allowed imports i and his domestic production. This sum is less than x.

Consumption-based sharing insures that members who do not import oil will share their domestic production during crises. Thus the plan applies equally to all members who are not targets of a selective embargo.

Imports and Stock Withdrawals During Moderate and Severe Crises

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8. A moderate crisis occurs when the members as a group suffer a loss in consumption of between seven and fourteen percent. In such cases, each member restrains his oil demand by 7%, and each draws from his stock at a daily rate determined so that when all members consume at 93% of normal, then all exhaust their stocks at the same time. This principle dictates import shares.

9. To derive the list of import shares that the IEP allows during any particular crisis, we define the members' combined normal daily oil consumption as C, their normal total daily production as P, and their total daily crisis imports as I. Their combined shortfall, to be drawn from stocks, is then

$$S = .93C - P - I.$$

10. If a member's agreed emergency oil stock is t mb, and the group's total emergency stock is T mb, then the member's daily stock drawdown obligation is

$$d = (t/T)S.$$

When each member depletes his stock at the agreed rate, then each exhausts his stock at the same time.

11. If the member normally consumes oil at a rate of c mb/d, and if he produces p mb/d, then he needs imports of

$$n = .93c - p$$

in order to maintain his consumption at 93% of normal. The crisis imports that the IEP allows him are

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$$i = n - d,$$

where d is his stock drawdown obligation.

12. A severe crisis occurs when the group must reduce its total oil consumption by 14% or more. Here each member restrains his oil demand by 10% rather than 7% as in moderate crises. With this exception, import shares and stock withdrawals are determined just as in moderate crises.

Gains from Losses: Anomalies in Moving from Mild to Moderate Crises

13. Because the IEP distinguishes targets of selective embargoes (under both Options a. and b. described above) an embargoed member can gain imports as a crisis worsens. For example, if during an embargo in 1973 against only the US the US loss equals 6.99% of the group's consumption, then the crisis is mild. In this case Option a. allows the US imports of 4.62 mb/d, and Option b. allows 5.09 mb/d. When the group's loss in consumption increases from 6.99% to 7%, then the crisis is moderate. In this case the IEP allows the US imports of 4.7 mb/d. In this scenario the effect of Option a. is perverse whereas that of Option b. is not.

SCENARIOS IN 1973

14. Having described the IEP, we turn now to its effects during oil embargoes. Had the US been embargoed in 1973, an IEP would have helped. For example, if a selective embargo directed only against the US had been intended to reduce US imports by 60%, the US would have lost only 23% of its imports under the IEP (see Table 1 for similar estimates pertaining to embargoes of different severity).

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Table 1
Oil Imports in 1973 That the IEP Would Have Allowed the US During Embargoes Directed Only Against the US

Percentage of Normal US Imports that an Embargo Allows	Percentage of Normal US Imports that the IEP Allows 1/	Days that US Stocks Last Under the IEP 2/
5	65	496
10	70	321
20	72	418
30	74	601
40	77	1066
50	79	4747
75	83	1334
100	100	forever

1. We assume that Option a. described above governs sharing during mild crises.

2. We assume that each IEP member maintains emergency oil stocks equal to thirty days of normal imports. Should each member maintain 60 days of normal imports in stock, these stocks would last twice as long as thirty-day stocks.

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15. In all crises, however, the US would have taken a larger percentage cut in imports than other members[1] (see Tables 2 and 3). The two options described above for sharing during mild crises would have produced negligibly different results during a 100% OAPEC embargo against the US alone.

16. In comparison with the IEP, import-based sharing would have helped the US more in 1973 (see Tables 4 and 5). Under consumption-based sharing, the US would have fared in severe crises much worse than under the IEP (see Tables 6 and 7). The reverse would have been true during a 100% OAPEC embargo against the US (compare Tables 6 and 2).

17. Under a modified IEP that specifies a single demand restraint level of 10% when the group's embargo loss exceeds 10% of its normal consumption, the US would have gotten 74% of its normal imports during a 100% OAPEC embargo of the US in 1973 (see Table 8). In this case the US would have fared much better without the modifications.

SCENARIOS IN 1980

18. To calculate potential effects of the IEP in 1980, we must assume forecasts of each member's oil imports. To examine selective embargoes, we must also predict trade flows. Particularly for the US, these forecasts are difficult to make since we do not know what energy policies will be. With this caveat, we rely on the most recent OECD demand and supply projections made on the assumption of an oil import price of $9 per barrel.

1. We assume that Canadian oil exports to the US are exogenous supplies to the IEP group. These exports would continue during all the crises we consider.

Table 2
Oil Imports the IEP Would Allow During Embargoes in 1973
(in millions of barrels per day and in percent of normal imports)

Embargo	Total Imports Available 1/ (mb/d)	(%)	United States (mb/d)	(%)	Canada (mb/d)	(%)	Western Europe (mb/d)	(%)	Japan (mb/d)	(%)	Days That Stocks Last 2/
100% OPEC	3.9	14	0	0	0.1	11	2.7	19	1.0	19	42
100% OPEC minus Iran	8.2	30	0.9	16	0.3	27	5.1	35	1.9	35	54
100% OAPEC	12.6	47	1.9	32	0.4	44	7.5	51	2.8	51	78
50% OPEC	15.4	57	2.5	43	0.5	54	9.1	61	3.4	62	107
100% OAPEC minus Saudi Arabia	18.3	68	3.1	53	0.6	65	10.6	72	3.9	73	172
50% OAPEC	19.8	73	3.5	59	0.7	70	11.4	78	4.2	78	251
25% OAPEC	23.4	87	4.5	76	0.8	85	13.2	90	4.9	90	986
100% OAPEC against the US	25.5	94	4.9 (4.8)	83 (81) 3/	1.0 (1.0)	98 (97)	14.4 (14.5)	98 (98)	5.3 (5.3)	98 (98)	1260

1. Total imports available to the US, Canada, Western Europe, and Japan.

2. We assume that each IEP member maintains emergency oil stocks equal to thirty days of normal imports. Should each member maintain 60 days of normal imports in stock, these stocks would last twice as long as thirty-day stocks.

3. Numbers in parentheses were calculated under consumption-based sharing (Option b.) during mild crises.

Table 3
Oil Imports the IEP Would Allow During Embargoes in 1973
(in millions of barrels per day and in percent of normal imports)

Embargo	Total Imports Available 1/ (mb/d)	(%)	France (mb/d)	(%)	West Germany (mb/d)	(%)	United Kingdom (mb/d)	(%)	Italy (mb/d)	(%)	Other Western European Countries (mb/d)	(%)	Days That Stocks Last 2/
100% OPEC	3.9	14	0.5	19	0.5	19	0.4	19	0.4	19	0.9	18	42
100% OPEC minus Iran	8.2	30	0.9	35	1.0	35	0.8	35	0.7	35	1.7	35	54
100% OAPEC	12.6	47	1.3	51	1.5	51	1.2	51	1.1	51	2.5	51	78
50% OPEC	15.4	57	1.6	62	1.8	61	1.4	62	1.3	62	3.0	61	107
100% OAPEC minus Saudi Arabia	18.3	68	1.8	73	2.1	72	1.7	73	1.5	73	3.5	72	172
50% OAPEC	19.8	73	2.0	78	2.3	78	1.8	78	1.5	78	3.8	77	251
25% OAPEC	23.4	87	2.3	90	2.6	90	2.1	90	1.9	90	4.3	90	986
100% OAPEC against the US	25.5	94	2.5	98	2.9	98	2.2	98	2.1	98	4.7	98	1260
			(2.5) 3/	(98)	(2.9)	(98)	(2.2)	(98)	(2.1)	(98)	(4.8)	(98)	

1. Total imports available to the US, Canada, Western Europe, and Japan.

We assume that each IEP member maintains emergency oil stocks equal to thirty days of normal imports. Should each member maintain 60 days of normal imports in stock, these stocks would last twice as long as thirty-day stocks.

Numbers in parentheses were calculated under consumption-based sharing (Option b.) during mild crises.

Table 4
Oil Imports that Import-Based Sharing Allows During Embargoes in 1973
(in millions of barrels per day and in percent of normal imports)

Embargo	Total Imports Available 1/ (mb/d)	(%)	United States (mb/d)	(%)	Canada (mb/d)	(%)	Western Europe (mb/d)	(%)	Japan (mb/d)	(%)
100% OPEC	3.9	14	0.8	14	0.1	14	2.1	14	0.8	14
100% OPEC minus Iran	8.2	31	1.8	31	0.3	31	4.5	31	1.7	31
100% OAPEC	12.6	47	2.8	47	0.5	47	6.9	47	2.5	47
50% OPEC	15.4	57	3.4	57	0.6	57	8.4	57	3.1	57
100% OAPEC minus Saudi Arabia	18.3	68	4.0	68	0.7	68	10.0	68	3.7	68
50% OAPEC	19.8	73	4.3	73	0.7	73	10.8	73	4.0	73
25% OAPEC	23.4	87	5.1	87	0.9	87	12.8	87	4.7	87
100% OAPEC against the US	25.5	94	5.6	94	0.9	94	13.9	94	5.1	94

1. Total imports available to the US, Canada, Western Europe, and Japan.

Table 5
Oil Imports that Import-Based Sharing Would Allow During Embargoes in 1973
(in millions of barrels per day and in percent of normal imports)

Embargo	Total Imports Available 1/ (mb/d)	(%)	France (mb/d)	(%)	West Germany (mb/d)	(%)	United Kingdom (mb/d)	(%)	Italy (mb/d)	(%)	Other Western European Countries (mb/d)	(%)
100% OPEC	3.9	14	0.4	14	0.4	14	0.3	14	0.3	14	0.7	14
100% OPEC minus Iran	8.2	31	0.8	31	0.9	31	0.7	31	0.6	31	1.5	31
100% OAPEC	12.6	47	1.2	47	1.4	47	1.1	47	1.0	47	2.3	47
50% OPEC	15.4	57	1.4	57	1.7	57	1.3	57	1.2	57	2.8	57
100% OAPEC minus Saudi Arabia	18.3	68	1.7	68	2.0	68	1.6	68	1.4	68	3.3	68
50% OAPEC	19.8	73	1.9	73	2.2	73	1.7	73	1.5	73	3.6	73
25% OAPEC	23.4	87	2.2	87	2.5	87	2.0	87	1.8	87	4.2	87
100% OAPEC against the US	25.5	94	2.4	94	2.8	94	2.2	94	2.0	94	4.6	94

1. Total imports available to the US, Canada, Western Europe, and Japan.

Table 6
Oil Imports that Consumption-Based Sharing Would Allow During Embargoes in 1973
(in millions of barrels per day and in percent of normal imports)

Embargo	Total Imports Available 1/ (mb/d)	(%)	United States (mb/d)	(%)	Canada (mb/d)	(%)	Western Europe (mb/d)	(%)	Japan (mb/d)	(%)
100% OPEC	3.9	14	-4.2	-72	0.0	- 4	5.9	40	2.3	42
100% OPEC minus Iran	8.2	31	-2.3	-39	0.2	16	7.5	51	2.9	53
100% OAPEC	12.6	47	-0.4	- 7	0.3	35	9.2	63	3.5	64
93 OPEC	15.4	57	0.8	14	0.5	48	10.3	70	3.8	71
100% OAPEC minus Saudi Arabia	18.3	68	2.1	36	0.6	61	11.4	77	4.2	78
93% OAPEC	19.8	73	2.8	47	0.7	68	12.0	81	4.4	82
75% OAPEC	23.4	87	4.3	73	0.8	84	13.3	91	4.9	91
100% OAPEC against the US	25.5	94	5.2	89	0.9	93	14.1	96	5.2	96

1. Total imports available to the US, Canada, Western Europe, and Japan.

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Table 7
Oil Imports that Consumption-Based Sharing Would Allow During Embargoes in 1973
(in millions of barrels per day and in percent of normal imports)

Embargo	Total Imports Available 1/ (mb/d)	(%)	France (mb/d)	(%)	West Germany (mb/d)	(%)	United Kingdom (mb/d)	(%)	Italy (mb/d)	(%)	Other Western European Countries (mb/d)	(%)
100% OPEC	3.9	14	1.0	41	1.1	39	1.0	42	0.9	42	1.8	38
100% OPEC minus Iran	8.2	31	1.3	52	1.5	51	1.2	53	1.1	53	2.4	50
100% OAPEC	12.6	47	1.6	63	1.8	62	1.5	64	1.3	64	3.0	62
50% OPEC	15.4	57	1.8	71	2.0	70	1.6	71	1.5	71	3.4	69
100% OAPEC minus Saudi Arabia	18.3	68	2.0	78	2.3	77	1.8	78	1.6	78	3.7	77
50% OAPEC	19.8	73	2.1	82	2.4	81	1.9	82	1.7	82	3.9	81
25% OAPEC	23.4	87	2.3	91	2.7	91	2.1	91	1.9	91	4.4	91
100% OAPEC against the US	25.5	94	2.4	96	2.8	96	2.2	96	2.0	96	4.7	96

1. Total imports available to the US, Canada, Western Europe, and Japan.

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Table 8
Oil Imports That a Modified IEP Would Allow During Embargoes in 1973[1/]
(in millions of barrels per day and in percent of normal imports)

Embargo	Total Imports Available 2/ (mb/d)	(%)	United States (mb/d)	(%)	Canada (mb/d)	(%)	Western Europe (mb/d)	(%)	Japan (mb/d)	(%)	Days That Stocks Last 3/
100% OPEC	3.9	14	0.0	0	0.1	11	2.7	19	1.0	19	42
100% OPEC minus Iran	8.2	31	0.9	16	0.3	27	5.1	35	1.9	35	55
100% OAPEC	12.6	47	1.9	32	0.4	44	7.5	51	2.8	51	78
50% OPEC	15.4	57	2.5	43	0.5	54	9.1	62	3.4	62	107
100% OAPEC minus Saudi Arabia	18.3	68	3.1	53	0.6	65	10.6	72	3.9	73	172
50% OAPEC	19.8	73	3.5	59	0.7	70	11.4	78	4.2	78	251
25% OAPEC	23.4	87	5.5	94	0.9	95	12.2	83	4.8	89	172
100% OAPEC against the US	25.5	94	4.4	74	1.0	100	14.7	100	5.4	100	117

1. The modified IEP consists of a single level 10% demand restraint with a 10% trigger.

2. Total imports available to the US, Canada, Western Europe, and Japan.

3. Stocks are assumed equal to 30 days of normal imports.

19. The OECD projections show both Canada and the UK as net oil exporters in 1980. The current IEP does not specify terms of agreement for members who export oil. We assume that Canadian and UK exports would continue during any embargo of the IEP group. Thus we treat these countries' net exports as supplies from outside the group.

20. Under our assumptions, the IEP benefits to the US begin to wane in 1980. Should OAPEC cut its 1980 exports by half, the US would under the IEP lose 76% of its imports. But Western Europe would lose only 24% (for similar estimates with respect to other crises, see Tables 9 and 10).

SCENARIOS IN 1985

21. By 1985, both the US and the UK become net exporters. As in our calculations for 1980, we assume for 1985 that IEP members continue their normal net exports during crises.

22. Our assumptions suggest that by 1985 the IEP could become a burden to the US. In virtually all the crises we examine, the US is required to curtail its oil consumption by more than 1.3 mb/d (see Table 11). Similarly, Canada and the UK would find the IEP a burden in 1985 (see Tables 11 and 12).

Table 9
Oil Imports the IEP Would Allow During Embargoes in 1980
(in millions of barrels per day and in percent of normal imports)

Embargo	Total Imports Available 1/ (mb/d)	(%)	United States (mb/d)	(%)	Canada (mb/d)	(%)	Western Europe (mb/d)	(%)	Japan (mb/d)	(%)	Days That Stocks Last 2/
100% OPEC	2.8	12	-0.9	-35	-0.2	- ∞	2.2	18	1.7	22	44
100% OPEC minus Iran	7.0	31	-0.4	-17	-0.2	- ∞	4.6	36	3.1	40	61
100% OAPEC	9.7	42	-0.1	- 5	-0.2	- ∞	6.1	47	4.0	52	79
50% OPEC	12.9	56	0.2	9	-0.2	- ∞	7.9	61	5.0	66	125
100% OAPEC minus Saudi Arabia	14.9	65	0.4	18	-0.2	- ∞	9.0	70	5.7	75	198
50% OAPEC	16.3	71	0.6	24	-0.2	- ∞	9.3	76	6.2	81	330
25% OAPEC	19.7	86	1.3	52	-0.1	- ∞	11.4	89	7.1	92	5140
100% OAPEC against the US	22.3	97	1.9	74	0.0	100	12.8	100	7.6	100	∞

1. Total imports available to the US, Canada, Western Europe, and Japan.

2. We assume that each IEP member maintains emergency oil stocks equal to thirty days of normal imports. Should each member maintain 60 days of normal imports in stock, these stocks would last twice as long as thirty-day stocks.

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Table 10
Oil Imports the IEP Would Allow During Embargoes in 1980
(in millions of barrels per day and in percent of normal imports)

Embargo	Total Imports Available 1/ (mb/d)	(%)	France (mb/d)	(%)	West Germany (mb/d)	(%)	United Kingdom (mb/d)	(%)	Italy (mb/d)	(%)	Other Western European Countries (mb/d)	(%)	Days That Stocks Last 2/
100% OPEC	2.8	12	0.7	22	0.8	22	-0.3	- ∞	0.6	22	0.4	13	44
100% OPEC minus Iran	7.0	31	1.3	40	1.5	40	-0.3	- ∞	1.1	40	1.1	32	61
100% OAPEC	9.7	42	1.6	52	1.9	52	-0.3	- ∞	1.4	52	1.5	43	79
50% OPEC	12.9	56	2.1	66	2.4	66	-0.3	- ∞	1.7	66	1.9	57	125
100% OAPEC minus Saudi Arabia	14.9	65	2.4	75	2.7	75	-0.3	- ∞	2.0	75	2.2	66	198
50% OAPEC	16.3	71	2.5	81	3.0	81	-0.3	- ∞	2.1	81	2.4	72	330
25% OAPEC	19.7	86	2.9	92	3.4	92	-0.2	- ∞	2.4	92	2.9	86	5140
100% OAPEC against the US	22.3	97	3.1	100	3.7	100	0.0	100	2.6	100	3.4	100	∞

1. Total imports available to the US, Canada, Western Europe, and Japan.

2. We assume that each IEP member maintains emergency oil stocks equal to thirty days of normal imports. Should each member maintain 60 days of normal imports in stock, these stocks would last twice as long as thirty-day stocks.

Table 11
Oil Imports the IEP Would Allow During Embargoes in 1985
(in millions of barrels per day and in percent of normal imports)

Embargo	Total Imports Available 1/ (mb/d)	(%)	United States (mb/d)	(%)	Canada (mb/d)	(%)	Western Europe (mb/d)	(%)	Japan (mb/d)	(%)	Days That Stocks Last 2/
100% OPEC	2.0	10	-1.8	- ∞	-0.2	-354	1.9	19	2.1	23	45
100% OPEC minus Iran	6.1	32	-1.8	- ∞	-0.2	-332	4.1	40	4.0	45	67
100% OAPEC	7.8	41	-1.8	- ∞	-0.2	-323	5.0	50	4.8	54	84
50% OPEC	10.5	55	-1.8	- ∞	-0.2	-309	6.4	64	6.1	68	139
100% OAPEC minus Saudi Arabia	12.5	65	-1.8	- ∞	-0.2	-298	7.4	74	7.0	78	260
50% OAPEC	13.5	71	-1.3	- ∞	-0.1	-184	7.7	77	7.1	80	227
25% OAPEC	16.3	85	0	100	0.1	91	8.5	85	7.7	86	332
100% OAPEC against the US	19.1	100	0	100	0.1	100	10.1	100	9.0	100	∞

1. Total imports available to the US, Canada, Western Europe, and Japan.

2. We assume that each IEP member maintains emergency oil stocks equal to thirty days of normal imports. Should each member maintain 60 days of normal imports in stock, these stocks would last twice as long as thirty-day stocks.

Table 12
Oil Imports the IEP Would Allow During Embargoes in 1985
(in millions of barrels per day and in percent of normal imports)

Embargo	Total Imports Available 1/ (mb/d)	(%)	France (mb/d)	(%)	West Germany (mb/d)	(%)	United Kingdom (mb/d)	(%)	Italy (mb/d)	(%)	Other Western European Countries (mb/d)	(%)	Days That Stocks Last 2/
100% OPEC	2.0	10	0.6	23	0.7	23	-0.2	- ∞	0.5	24	0.4	15	45
100% OPEC minus Iran	6.1	32	1.1	45	1.3	45	-0.2	- ∞	0.9	45	1.0	36	67
100% OAPEC	7.8	41	1.3	54	1.5	54	-0.2	- ∞	1.1	54	1.2	46	84
50% OPEC	10.5	55	1.7	68	1.9	68	-0.2	- ∞	1.4	68	1.6	60	139
100% OAPEC minus Saudi Arabia	12.5	65	1.9	78	2.2	78	-0.2	- ∞	1.6	79	1.9	70	260
50% OAPEC	13.5	71	2.0	80	2.3	80	-0.2	- ∞	1.6	80	2.0	74	227
25% OAPEC	16.3	85	2.1	86	2.5	86	0.0	100	1.8	86	2.2	82	332
100% OAPEC against the US	19.1	100	2.5	100	2.9	100	0.0	100	2.0	100	2.7	100	∞

1. Total imports available to the US, Canada, Western Europe, and Japan.

2. We assume that each IEP member maintains emergency oil stocks equal to thirty days of normal imports. Should each member maintain 60 days of normal imports in stock, these stocks would last twice as long as thirty-day stocks.

ANNEX

A Data Base for Calculating IEP Effects on Oil Imports and Emergency Stocks

1. This annex shows the raw data we use in calculating potential effects of the IEP (see Tables 13 through 16).

2. In interpreting these tables, three facts are important:

-- For 1973, we assume that Canadian exports to the US are exogenous supplies to the IEP group.

-- For other years, we assume that IEP members' net exports are exogenous supplies to the group.

-- To examine the IEP effects during crises, we must forecast oil trade flows. To predict these values, we assume--for example--that in 1973, 1980, and 1985 OPEC will account for the same fraction of US oil imports.

Table 13
Oil Consumption, Production and Imports by Countries in 1973
(in million barrels per day, rounded to one decimal)

	Consumption	Production	Imports
United States	17.3	11.4	5.9
Canada	1.8	0.8	1.0
Japan	5.4	0	5.4
France	2.6	Negl.	2.5
West Germany	3.1	0.1	2.9
United Kingdom	2.3	0	2.3
Italy	2.1	0	2.1
Other Western Europe	5.1	0.3	4.9
Total Western Europe	15.2	0.4	14.7
Total All Countries	39.6	12.6	27.0

Table 14
Percentage of Oil Imports Supplied in 1973 to IEP Members by Groups of Producers

	OPEC	OPEC Minus Iran	OAPEC	OAPEC Minus Saudi Arabia
United States	72.7	66.0	25.6	16.1
Canada	93.0	75.0	22.0	14.0
Japan	90.9	58.9	44.3	21.3
France	89.2	81.3	74.5	52.2
West Germany	91.1	79.1	71.6	50.2
United Kingdom	88.8	69.1	63.5	39.9
Italy	85.2	71.7	79.1	53.3
Other Western Europe	88.0	71.9	65.0	33.1
Total Western Europe	88.4	74.3	69.7	43.4
Total All Countries	85.5	69.4	53.2	40.0

Table 15
Oil Consumption, Production and Imports by Countries in 1980
(in million barrels per day, rounded to one decimal)

	Consumption	Production	Imports
United States	16.9	14.4	2.5
Canada	2.1	2.1	0
Japan	7.7	0.1	7.6
France	3.2	Negl.	3.1
West Germany	3.8	0.1	3.7
United Kingdom	2.8	2.8	0
Italy	2.6	0	2.6
Other Western Europe	6.4	3.0	3.4
Total Western Europe	18.8	6.0	12.8
Total All Countries	45.5	22.5	23.0

Table 16
Oil Consumption, Production and Imports by Countries in 1985
(in million barrels per day, rounded to one decimal)

	Consumption	Production	Imports
United States	17.9	17.9	0
Canada	2.4	2.3	0.1
Japan	9.1	0.2	9.0
France	2.5	Negl.	2.5
West Germany	3.0	0.1	2.9
United Kingdom	2.2	2.2	0
Italy	2.0	0	2.0
Other Western Europe	5.0	2.3	2.7
Total Western Europe	14.8	4.7	10.1
Total All Countries	44.2	25.1	19.1

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