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Chapter 1
Introduction

This report was prepared under contract to the Office of Energy of AID in order to assist that office and the USAID mission in Honduras in an early phase of their planning for possible projects in the energy sector of that country. The emphases in the document are in part the result of guidance from AID personnel before and early on in the field work. Thus, for example, our treatment of the electrical sector is less complete than that of the fuel sector though a few recommendations are made concerning possible policy oriented work (e.g., use of surplus hydro after 1986).

The first two chapters (i.e., Chapters Two and Three) are primarily diagnostic in character. Chapter Two covers the general economic and energy background. This review helps to describe the current structure of the energy sector, how energy (especially fuel) use has evolved relative to the economy and begins to describe some of the data limitations. Energy policy analysis in Honduras is relatively undeveloped. There is nothing remotely approaching a World Bank energy sector assessment for Honduras (one of these is in fact planned for 1984).

Chapter Three treats the institutional context of energy planning, policy making and implementation in Honduras. As is generally known, institutional capacity is fragmented and each fragment is usually weak. The discussion of institutional capacity is organized in terms of possible policy-making "tools" (e.g., physical regulation, taxation, and the analysis used to establish policy). Which institutions determine the policies and the capabilities of these institutions are the types of questions addressed. International donor activities are also briefly reviewed. There is clearly great scope for

non-duplicative AID action. There is also a view, widely shared among those Hondurans and local representatives of international agencies who were questioned, that AID should play a key, probably the leading role in building up effective policy making capabilities. CONSUPLANE (the national planning council) is identified as the key coordinating counterpart institution for any broadly-based policy-oriented program.

In Chapter Four, "Targets of Opportunity", some physical changes in the energy system which have potential to reduce the costs to the country's economy in terms of ecology, balance of payments, or investment are sketched out. As the chapter's title suggests there is not a systematic, fully reasoned, argument complete with projections and the like. An analysis of that sort goes beyond the bounds of a reconnaissance study, especially one dependent on a limited information base. Rather we have sought to simply define and partially justify a number of directions judged to be of possible interest to AID. Almost all of the "targets of opportunity" are in fact addressed in the project proposals which follow. While we do not pretend to completeness, or methodological elegance, there is likely to be little controversy over whether the points selected merit attention. Other "targets of opportunity" may exist but most are likely to be in the practical domain of other international institutions (e.g., overall electrical system expansion plans).

Chapter Five presents specific project recommendations. Three interconnected projects in industrial and residential supply/demand and in overall pricing policy in Honduras are proposed for the Office of Energy. If there are budget constraints, the number of projects could be reduced to two. In addition, a distinct regional transportation policy project is proposed for separate funding. These projects have three basic objectives:

- improve the understanding of important issue areas;
- improve the continuing capability of the Honduran public and private sectors to create, execute and react to energy policy; and
- produce the analytical foundation for one or more USAID Honduras projects in the energy sector after FY 1985.

The possibility has been raised that the mission might be able to use some local currency funds, which are in the Central Bank, in 1984-1985. Several specific ways in which these funds might be used are suggested. These local funds would, among other things, reinforce the Office of Energy projects. If they were made available, probably all three proposed projects could be executed. If not, the Office of Energy program could probably be reduced to two projects. In addition, one longer-term project area was identified which is a straightforward extension of the mission's priorities. One of the Office of Energy projects would directly address this issue and a project concept should emerge which is likely to be of considerable interest to the mission. Mission involvement in the evaluation of this project could help ease the way into the possible actions raised by the other Office of Energy projects since they have overlapping aspects.

The Office of Energy's country selection criteria are also reviewed in this chapter. It is concluded that the need is there, that the potential for effective action exists, and, not surprisingly, that the country is important to US interests. The primary question lies within AID itself. Is the Honduras mission prepared to make issues affecting energy use in Honduras a priority? This is what outside consultants cannot tell AID, especially since it was not possible to meet the mission director. We did find a nucleus of interest; however it was not well-defined since Peter Dieken, the mission

officer most involved with energy, has left. Strong action is recommended for the mission and for the Office of Energy and there should be continued negotiations between the two.

Three consultants made up the field team; Alan Poole, Michael Lesser and Henry Jackson. The main text of this report was written by one of them, Alan Poole.

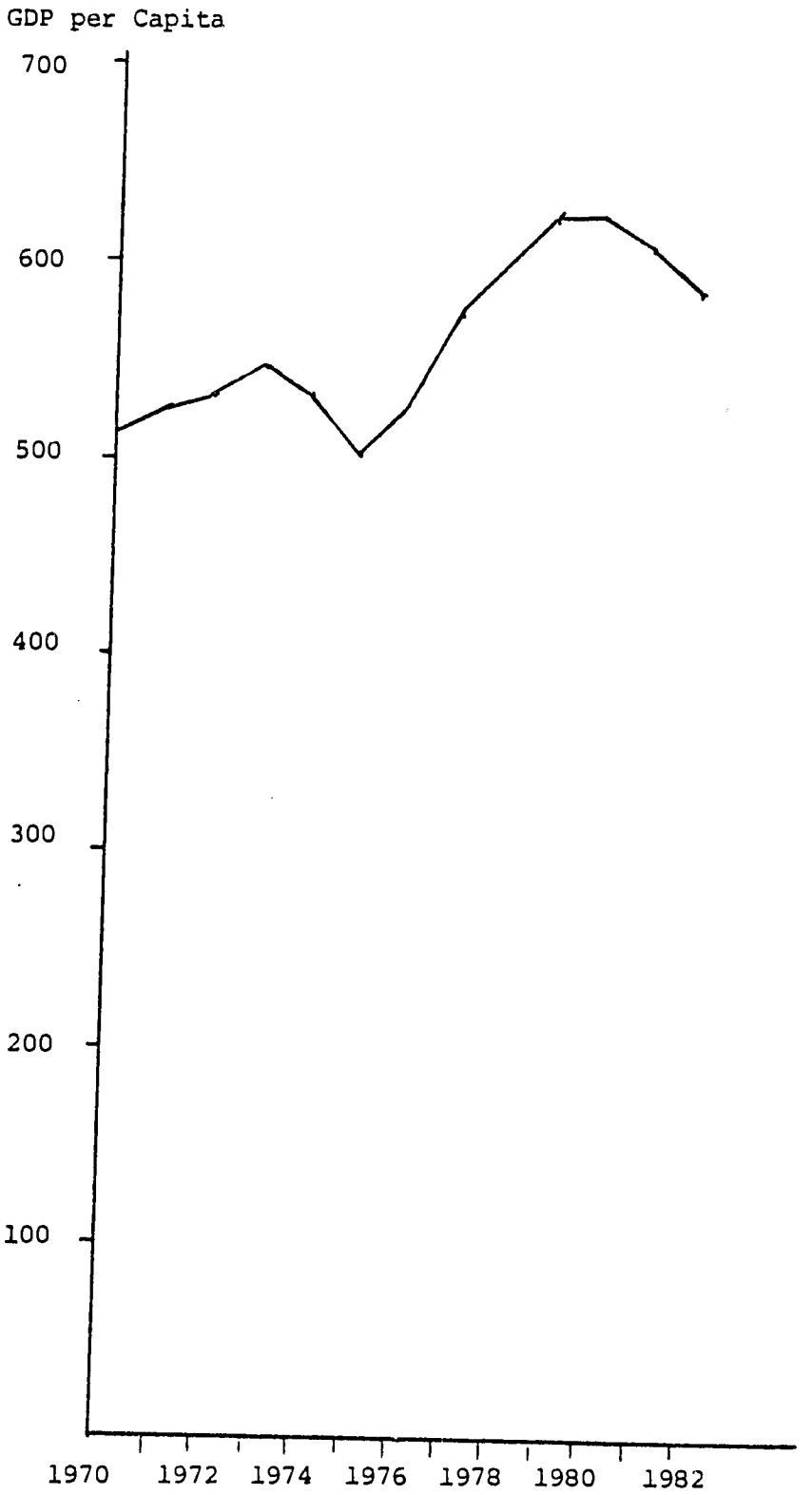
Chapter 2
Economic and Energy Background

The Economic Context

Honduras is one of the poorest and most slowly growing countries in Latin America. Over the decade of the 1970's per capita growth in GDP was only 11 percent, about one quarter the average for Latin America and one-half the rate at which the country grew during the 1960's. [13] As can be seen in Figure 2-1, this was due in part to a short, sharp recession in 1974-1975. The economy recovered rapidly from 1975 through 1979. In 1979 it began to stagnate, and since then has entered into a persistent, deepening recession. By 1982, GDP per capita had fallen 6 percent relative to 1980. The expectation is that the economy will continue to stagnate in 1983.[14] Prospects for recovery are clouded by the continued flight of private capital which is occurring as a consequence of fears that political turmoil in the region will increasingly effect the economy.[15]

The Honduran economy is relatively open and oriented to free enterprise.[5] Though there was a tendency in the 1970's for increased state intervention, in 1980 Honduras had a lower share of value added by the government sector than any other country in Latin America.[13] The new government is committed to strengthening the private sector's role. However, the above mentioned flight of private capital combined with other factors could seriously complicate this objective. Private sector fixed investment in 1982 was down approximately 30 percent (in real terms) relative to 1980. At the same time, pressure to reduce the growing government deficit has reduced public sector investment by 24 percent relative to 1980.[16]

Figure 2-1. Gross Domestic Product per Capita in Honduras since 1970 (constant 1966 lempiras)



Recent trends of the Honduran economy are summarized in Table 2-1. International trade plays a very important role. Exports amounted to about 31 percent of GDP in 1970-1971 and 29 percent in 1980-1981. Imports, however, grew faster, (from 31 to 38 percent of GDP) and the chronic problem of the trade balance, already well in evidence in previous decades, worsened. Certainly, a major difficulty was the sharp increase in oil prices combined with the inability to reduce the oil/GDP coefficient (all oil is imported) in the economy. A large fraction (about 50 percent) of the deterioration in the balance of trade between 1970-1971 and 1980-1981 can be ascribed arithmetically to oil alone.

The situation deteriorated sharply in 1982, at the same time that the new democratically-elected government (a political cornerstone of US regional policy) came into power after years of military rule. The broad reasons for this deterioration should be familiar to readers--among other things prices for primary products collapsed, international liquidity dried up, export earnings dropped sharply, and imports were cut drastically. Between 1980 and 1982 nominal imports dropped 30 percent. The distribution of this drop, broken down in Table 2-2, is instructive. Nonfuel imports dropped 35 percent in nominal terms while fuel dropped only 1.5 percent. As a consequence fuel imports (almost all oil or its derivatives) increased from 17 to 24 percent of total imports. Of all the major categories of imports, petroleum has proven to be the most resistant to reduction.

Broad Characteristics and Trends in the Energy Sector

The Energy Balance in 1980

A useful point of departure for diagnosis is a snapshot of the structure of energy use in Honduras in 1980, the last year for which a comprehensive

Table 2-1. Evolution of Gross Domestic Product (by Expenditure) 1970-1982

(millions of constant 1966 lempiras)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Private consumption	962	970	1013	1097	1086	1133	1205	1304	1469	1463	1555	1513	
Government consumption	152	157	167	154	177	189	225	248	260	274	297	326	
Gross fixed capital formation	207	195	192	236	257	273	289	334	366	385	416	314	
a) by private sector	134	140	148	172	185	180	190	209	228	243	255	187	
b) by public sector	73	55	44	64	72	93	99	125	138	142	161	127	
Variation of stocks	27	-2	7	15	69	-45	-58	61	25	41	30	30	
Export of goods and services	390	437	422	457	423	390	436	459	524	637	598	621	
Import of goods and services (-)	-441	-390	-379	-457	-512	-485	-525	-654	-762	-790	-829	-747	
Gross Domestic Product	1297	1367	1422	1502	1500	1455	1572	1752	1882	2010	2067	2077	2053

Sources: 1970-1981: Banco Central de Honduras, Departmento de Estudios Economicos

Table 2-2
Changes in Imports, 1978-82
(Millions of Current Lempiras)

	1978	1979	1980	1981	1982	1980-82
Imports by NAUCA class (CIF)						
food, drink and tobacco	111.7	123.6	179.9	168.6	129.8	-28
crude non-edible materials	21.0	19.2	22.2	19.7	15.4	-31
fuels and lubricants	152.7	226.0	342.3	326.4	337.2	-2
oils of animal or plant origin	14.6	13.7	23.3	22.7	11.0	-53
chemicals	213.0	275.5	308.6	332.2	249.6	-20
manufactured goods	411.7	508.5	558.6	550.1	404.6	-28
transport equipment	460.3	494.2	600.9	496.2	281.5	-53
Total Imports (CIF)			2038.6	1920	1436.8	-30
Imports by use (CIF)						
consumer goods			475.2	474.7	339.3	-29
fuels and lubricants			342.3	326.4	337.2	-2
other primary materials			595.3	602.4	463.0	-22
capital goods and goods for construction			622.8	512.2	289.5	-53

Source: Banco Central de Honduras, "Honduras en Cifras" 1978-80 and 1980-82, Tegucigalea.

data set was available. For this purpose we have used the estimates of the official energy balance, translating them into the somewhat simplified energy matrix shown in Table 2-3.

The most obvious and frequently observed aspect of the estimates in this matrix is the preponderant role of wood (and residues) in the energy supply of the country. Together they account for 66 percent of the energy consumed. While this is true in a narrow sense (allowing of course for unavoidable errors in estimation), it is also true that such a figure drastically overestimates the "useful work" provided by these resources relative to petroleum and hydropower as well as their importance to the economy. This point can be easily shown in the residential sector, where fuelwood (used for cooking) accounts for more than 80 percent of the fuelwood and residue consumption in the country. According to a survey performed by CONSUPLANE[12/] the specific consumption of fuel for cooking per household per year using one type of fuel exclusively is:

WOOD		KEROSENE		LPG	
tons	energy units (gigacalories)	bbls	energy units (gigacalories)	bbls	energy units (gigacalories)
6.63	23.86	2.58	3.36	2.26	2.14

Thus, in order to provide roughly the same service with currently used fuelwood technology we need 7-11 times more "energy" than when using LPG or kerosene. While these estimates are likely to be modified with time, the basic conclusion will not change. The same reasoning can be applied to other items in the energy balance. For example:

- the Balance Energetico Nacional uses the value of a kwh of electricity used in a heating application. This assumption has the great merit of precision (which is why the energy balance methodology uses it) but it obviously vastly

Table 2-3. Simplified Matrix of Energy Consumption in Honduras--1980

(Teracalories)

Sector	Fuelwood (1)	Agricultural Residues (2)	Charcoal (3)	LPG (4)	Gasoline (5)	Kerosene (6)	Diesel Oil (7)	Fuel Oil (8)	Refinery Gas (9)	Subtotal Petroleum Derivatives (Sum of columns 4 through 9) (10)	Electricity (11)	Total Energy (Sum of columns 1, 2, 3, 10 and 11) (12)
A) Residential	10,016	-	-	92	-	442	-	-	-	[illegible]	32	10,712
B) Commercial	-	-	18	6	26	8	27	-	-	[illegible]	91	16
C) Public	-	-	-	-	45	33	264	30	-	[illegible]	14	36
D) Transport	-	-	-	-	870	208	1,028	-	-	[illegible]	-	1,106
(E) Agriculture	-	-	-	-	25	-	185	10	-	[illegible]	35	255
(F) Industry	1,062	1,033	-	12	65	-	780	874	-	[illegible]	329	4,160
(G) Sub-total Final Demand	11,078	1,033	48	110	1,033	670	2264	905	0	[illegible]	691	17,832
(H) Refinery	-	-	-	-	-	-	-	137	116	253	-	729
(I) Electricity Generation	-	-	-	-	-	-	287	78	-	365	-	253
(J) Charcoal Production	111	-	-	-	-	-	-	-	-	-	-	365
(K) Sub-total Energy Sector Use	111	-	-	-	-	-	287	215	116	618	-	111
(L) Total (lines G&K)	11,189	1,033	48	110	1,033	670	2,551	1,120	116	5,000	691	18,561

Source: Based directly on Reference 17.

Notes: a) Line J, column 1, included only wood losses in charcoal production.

b) Coke has been excluded as insignificant.

c) Public sector consumption of gasoline, kerosene and diesel is basically for transport type functions.

underestimates the efficiency of using electricity (relative to, say, petroleum derivatives) in applications and conditions most common in Honduras.

- the traditional use of fuelwood and agricultural residues in industry is clearly very inefficient relative to the standards of efficiency when petroleum derivatives are used.

In order to help concentrate people's thinking about the structure of current energy consumption we have made a rough alternative estimate in Table 2-4 (column B) based on "useful work." Although the estimates are imprecise, Column B is a much closer reflection of the relative importance of different energy forms than Column A.

Several other structural points deserve comment:

- only a relatively small amount of total petroleum (6.5 percent) goes for electricity generation, although this figure probably does not include electricity auto-generation.

- total industrial petroleum derivative consumption is quite high. In terms of final demand for derivatives (line G in Table 2-3), Honduras is no different than the Central American average 18/ --a result which few people would expect. One reason for this is the very high diesel consumption, a matter which will be treated later.

- transport is, predictably, very important. Bearing in mind that transport accounts for most of the public sector consumption, almost 50 percent of the final demand goes into this use.

Changes in Petroleum Derivative Consumption Since 1970

The ratio of petroleum consumption to GDP showed relatively little change over the decade of the 1970's, as shown in Table 2-5. This is especially true if we restrict ourselves to final demand (which excludes consumption of derivatives used within the energy sector for electricity generation and refining). If anything, final demand was a bit higher at the end of the period (e.g., from 1976-1980) than at the beginning (1970-1973), though the

Table 2-4. Comparison of Alternative Concepts for Measuring Contribution of Different Forms of Energy to Final Consumption in Honduras in 1980

	Percent Contribution to Energy Supply Based On: A enthalpy	B approximate useful work
Fuelwood and charcoal	62	20
Residues	6	5
Petroleum derivatives	28	53
Electricity (predominantly hydro, see notes)	4	22

Notes: Column A

a) Enthalpy calculation is based on energy consumption as conventionally defined using the heat value of each fuel but not its end-use efficiency.

Column B

a) It is assumed that wood consumption of 23.86 Gcal per household for cooking is equivalent to 3.05 Gcal of petroleum derivative.

b) Fuelwood and residues in industry are consumed at 50 percent of the efficiency at which petroleum derivatives are used, in both cases assuming systems commonly used today.

c) Charcoal is assumed to be the same as in the National Energy Balance since there it is limited to special types of cooking.

d) Electricity is assumed to provide three times the useful work at the point of the consumer per kcal of enthalpy as petroleum derivatives as an average for the application common in Honduras. One could of course argue endlessly about what the relationship really is.

e) In 1980, 84 percent of electricity was generated from hydro. We have chosen end-use, or final consumption, in order to avoid the complications inherent in including transformations within the energy sector. They would not change the results by much.

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Table 2-5. Petroleum Consumption
(teracalories per million 1966 lempiras)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Final demand for petroleum derivatives per unit GDP	2.33	2.23	2.32	2.41	2.39	2.72	2.52	2.47	2.53	2.55	2.42
Total consumption of petroleum derivatives per unit GDP	2.87	2.71	2.69	2.78	2.74	3.11	3.02	3.02	2.86	2.83	2.71

Source: Table 2-1 and Balance Energetico Nacional (as reported in Table 2-7).

difference is small enough (about 10 percent) as to be barely significant, and within each period the ratio shows no clear trend.

Although a consistent series of estimates was not available beyond 1980, Central Bank estimates for 1978-1982 (Table 2-6) show very little change in overall consumption of derivatives per unit GDP from 1980-1982. These estimates follow the trend of the 1970-1980 Balance Energetico Nacional quite closely for 1978-1980.

Although there was relatively little change in the overall use of petroleum relative to GDP, there were shifts in the shares of different derivatives (Table 2-7). From 1970/71 to 1979/80 gasoline's share fell from about 24 percent to 19 percent, while diesel increased from 42 percent to 46 percent. LPG and kerosene also increased their shares, the former from 1.3 percent to 2.0 percent and the latter from about 10.5 percent to 12 percent. Fuel oil's share remained virtually constant. If we consider only final demand, the fall in gasoline and the rise in diesel are more pronounced. From 1980 to 1982 the share of <u>all</u> derivatives except diesel fell (Table 2-6). Diesel alone now accounts for 50 percent of all petroleum fuel consumed in the country (in energy rather than volume terms) and has clearly emerged as the critical derivative.

The evolution over the decade of petroleum demand by sector, as estimated by the Balance Energetico Nacional, is shown in Table 2-8. The single most important change was the increase of final demand (that is the direct consumption by sectors other than energy) relative to the total demand for petroleum derivatives. Final demand's share rose from about 80 percent of the total at the beginning of the decade to about 90 percent at the end. This was

Table 2-6. A Distinct Time Series for Consumption of Derivatives of Petroleum Relative to GDP 1978-1982

	1978		1979		1980		1981		1982	
	1000 barrels	Tcal	1000 barrels	Tcal	1000 barrels	Tcal	1000 barrels	Tcal	1000 barrels	Tcal
LPG	131.2	122.7	132.9	124.3	120.6	112.8	129.0	120.6	96.3	90.0
Gasoline and aviation gasolines	893.0	1079.6	911.8	1102.4	842.8	1018.9	814.5	984.7	791.2	956.6
Kerosene and jet fuel	460.2	608.8	491.4	650.1	503.1	665.6	454.4	601.2	451.1	596.8
Diesel	1759.3	2463.0	1737.5	2432.5	1728.2	2419.5	1735.9	2430.3	1883.5	2636.9
Fuel oil	566.1	822.0	696.4	1012.6	696.0	1010.6	766.8	1113.4	589.8	856.4
TOTAL		5096.1		5321.5		5218.4		5250.2		5136.7
Energy per unit of GDP (Tcal per million 1966 lempiras)		2.71		2.65		2.52		2.53		2.50

Source: Banco Central de Honduras, Departmento de Estudios Economicos

LPG - 0.935 Gcal; gasoline - 1.209 Gcal; kerosene - 1.323 Gcal
Diesel - 1.400 Gcal; Fuel Oil - 1.452 Gcal.

2. There are discrepancies between the Central Bank data for 1978-1980 and the data from the Balance Energetico Nacional in Table 2-7. Most are unimportant, but the fuel oil difference is large. This may be attributable to the Central Bank excluding fuel oil consumption in the refinery, an assumption which brings the two data series very close together. The consistently larger Central Bank estimate for LPG may be due to wider coverage of independent dealers, who also import independently.

Table 2-7. Evolution of Total and Final Demand for Petroleum Derivatives, 1970-1980

(Teracalories)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Final Demand											
- LPG	49.1	57.0	60.0	72.8	74.1	82.2	93.5	103.8	102.5	109.2	110.4
- Gasoline	854.0	915.2	948.2	1,011.8	933.3	910.1	940.8	1,004.7	1,094.1	1,117.4	1,032.6
- Kerosene	357.1	409.2	413.7	441.4	415.7	444.5	475.5	512.8	614.9	652.6	669.8
- Diesel	1,120.6	1,117.7	1,258.2	1,461.8	1,415.9	1,545.8	1,683.2	1,966.8	2,184.2	2,310.5	2,264.1
- Fuel Oil	635.4	551.4	613.3	633.2	741.1	969.0	774.9	731.0	766.6	929.4	904.7
Subtotal	3,016.2	3,050.5	3,293.4	3,621.0	3,580.1	3,951.6	3,967.9	4,319.1	4,762.3	5,119.1	4,981.6
Total Demand											
- LPG	49.1	57.0	60.0	72.8	74.1	82.2	93.5	103.8	102.5	109.2	110.4
- Gasoline	854.0	915.2	948.2	1,011.8	933.3	910.1	940.8	1,004.7	1,094.1	1,117.4	1,032.6
- Kerosene	357.1	409.2	413.7	441.4	415.7	444.5	475.5	512.8	614.9	652.6	669.8
- Diesel	1,565.9	1,555.0	1,589.4	1,818.1	1,686.1	1,793.0	1,995.4	2,441.2	2,443.4	2,535.7	2,551.4
- Fuel Oil	838.3	732.7	788.7	815.5	971.5	1,276.4	1,118.8	1,109.3	1,005.4	1,138.1	1,119.6
Subtotal	3,664.4	3,669.1	3,800.0	4,159.6	4,080.7	4,506.2	4,624.0	5,171.8	5,260.3	5,553	5,483.8
- Refinery Gas	62.3	29.0	21.9	23.4	23.4	23.8	130.2	117.2	130.9	129.2	115.6
Total	3,726.7	3,698.1	3,821.9	4,183.0	4,104.1	4,530.0	4,754.2	5,289.0	5,391.2	5,682.2	5,599.4

Source: Balance Energetico Nacional 1970-1980.

Table 2-8. Change in Sectoral Demand for Petroleum Derivatives - Selected Years 1970-1980

		Teracalories					Percent of total demand (Percent of final demand)				
		1970	1973	1976	1979	1980	1970	1973	1976	1979	1980
Transport -	diesel	596	766	862	1,051	1,028					
	gasoline	706	867	794	936	870					
	kerosene	51	88	121	193	208					
Sector Total		1,353	1,722	1,777	2,180	2,106	36.3 (44.9)	41.2 (47.6)	37.4 (44.8)	38.4 (42.6)	37.6 (42.3)
Public -	diesel	73	100	129	250	244					
	gasoline	44	39	43	44	45					
Sector Total		146	175	219	348	342	3.9 (4.8)	4.2 (4.8)	4.6 (5.5)	6.1 (6.8)	6.1 (6.9)
Residential -	LPG	43	61	78	91	92					
	kerosene	279	322	323	420	422					
Sector Total		322	383	401	511	514	8.6 (10.7)	9.2 (10.6)	8.4 (10.1)	9.0 (10.0)	9.3 (10.3)
Commercial Sector Total		42	44	50	67	67	1.1 (1.4)	1.0 (1.2)	1.1 (1.3)	1.2 (1.3)	1.2 (1.3)
Agriculture -	diesel	101	141	154	188	185					
Sector Total		136	162	178	229	220	3.7 (4.5)	3.9 (4.5)	3.7 (4.5)	4.0 (4.5)	3.9 (4.4)
Industry -	diesel	343	444	524	793	780					
	fuel oil	628	622	749	899	874					
Sector Total		1,018	1,135	1,342	1,785	1,732	27.3 (33.8)	27.1 (31.3)	28.2 (33.8)	31.4 (34.9)	30.9 (34.8)
Final demand		3,016	3,621	3,968	5,119	4,982	80.9 (100)	86.6 (100)	83.5	90.1	89.0
Electricity -	diesel	445	356	312	225	287					
	fuel oil	0	0	188	82	78					
Sector Total		445	356	500	307	365	11.9	8.5	10.5	5.4	6.5
Refinery Sector Total		265	206	286	256	253	7.1	4.9	6.0	4.5	4.5
Total derivative consumption		3,726	4,183	4,754	5,682	5,600	100	100	100	100	100

Source: Balanca Energetico Nacional

primarily due to the generally increasing substitution of thermal by hydroelectric power as shown in Table 2-9. In 1970 no less than 46 percent of total electricity generated was generated in oil-fueled plants--all diesel. By 1980 that had fallen to 16 percent, of which some 70 percent were diesel. Superimposed on this trend was a significant oscillation. From 1970 to 1974 thermally generated electricity fell from 46 percent to 23 percent, it then rose again to 32 percent in 1977 and dropped sharply to 13 percent in 1979. Hydrologic conditions and plant construction schedules all had a role. It appears that the thermal contribution has been rising again since 1979 though unfortunately post-1980 quantitative data was unavailable. This could have played a role in the strong post-1980 growth in diesel consumption noted earlier.

Fuel consumption for refining also dropped in relative importance over the decade, though less drastically. This is due in part to the increasing share of derivatives which are imported rather than produced in the refinery itself.

When we turn to the sectors which comprise final demand there is an apparent stability in the relative shares of each. The large transport sector appears to have declined slightly, which was compensated by a proportionate increase in the small public sector. Since the latter is dominated by vehicular energy use there is little real change.

We should be cautious in using these sectoral breakdowns, even as we acknowledge the tremendous advance that they represent over what was available only a couple of years ago. The line between vehicular (transport type) use and other sectors is particularly hard to draw. Firms, commercial or industrial, frequently maintain their own fleets; while on the other hand it

Table 2-9. Electricity Generation
(tera calories)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Total electricity generated	311	336	363	418	446	486	526	592	653	731	801
Hydroelectric	169	208	262	310	345	362	373	405	558	639	675
(%)	(54)	(62)	(72)	(74)	(77)	(74)	(71)	(68)	(85)	(87)	(84)
Thermal electric	142	128	101	108	101	124	154	187	95	92	126
(%)	(46)	(38)	(28)	(26)	(23)	(26)	(29)	(32)	(15)	(13)	(16)
Fuel for thermal electric generation	445	437	331	356	334	393	500	691	325	307	365
diesel	445	437	331	356	270	247	312	474	259	225	287
fuel oil	--	--	--	--	64	146	188	217	66	82	78
Total diesel consumption in all sectors	1566	1555	1589	1818	1686	1793	1995	2441	2443	2536	2551
Total fuel oil consumption in all sectors	838	733	789	816	972	1276	1118	1109	1005	1138	1120

is erroneous to assume that all "gasoline station" sales of diesel are for transport (an apparent flaw of the Costa Rican energy balance work). A reconnaisance work cannot delve into this kind of issue, but it is surely relevant to bear in mind when considering the tremendous growth of diesel ascribed to industry, even though we have been assured that at least major industrial truck fleets were rigorously excluded.

A time series of prices (nominal and real) for most derivatives over most of the period is presented in Table 2-10. An analysis of the impact of real price on demand for various derivatives was beyond the terms of reference for this work and would require careful consideration of underlying structural changes in the economy (usually dominated by factors other than fuel price), other policies (such as import tariffs), and income (for example the sharp fall in LPG use from 1981 to 1982, in the second year of declining real prices for that derivitive, appears attributable to the deepening recession).

The most important structural changes occurred in the transportation sector. Table 2-11 gives a crude idea of this by comparing the size of various components of the registered vehicle fleet to GDP. By the end of the decade there were two to three times as many vehicles per unit of GDP as there were in the beginning. The most rapid growth occurred during 1970-1976; however it is interesting to note that growth (relative to GDP) in 1978-1982 was no slower than during 1976-1979. If the sectoral consumption estimates in the Balance Energetico Nacional are even approximately correct it would appear that there have been rather significant improvements in efficiency (or

Table 2-10. Petroleum Product Prices in Both Current (lempira/gallon) and Constant Terms (index of 100 = December 1973)

		Premium Gas	Regular Gas	Kerosene	Jet Fuel	Diesel	Bunker C	LPG
July CPI	Sept. 1973	1.10 76	0.96 72	0.54 66	--	0.54 62	0.26 52	-- --
100	Dec. 1973	1.44 100	1.34 10	0.82 100	0.86 100	0.87 100	0.50 100	-- --
105.8	1974	1.74 114	1.63 114	0.91 105	0.98 108	0.95 103	0.51 96	-- --
116.5	1975	1.88 112	1.77 114	1.00 105	1.05 105	1.04 103	0.52 89	-- --
124.8	1976	1.98 110	1.87 112	1.02 100	1.09 102	1.06 98	0.52 83	-- --
133.1	1977	2.22 116	2.10 117	0.96 88	1.24 108	1.06 92	0.60 90	-- --
143.0	(1978)	2.35 114	2.18 114	1.07 91	1.40 114	1.16 93	0.68 95	-- --
152.9	1979	2.91 132	2.69 131	1.36 108	1.88 143	1.45 109	0.77 101	ni 100
173.6	1980	ni 150	ni 151	ni 143	ni 172	ni 136	ni 112	ni 104
198.3	1981	4.10 144	3.87 145	2.40 147	2.82 165	2.39 139	1.28 129	ni 91
216.5	1982	4.13 133	3.90 134	2.43 137	2.84 152	2.40 127	1.30 120	ni 83
237.2	1983	4.13 121	3.90 123	2.43 125	2.84 139	2.40 116	1.30 110	ni 76

Note: Upper number is price in current lempiras per gallon. Lower number is indexed price in constant 1973 prices.

Table 2-11.

Relation of Vehicle Fleet to GDP - Selected Years 1970-1982

(vehicles per million 1966 lempira of GDP)

	1970	1973	1976	1979	1980	1981	1982
Small Private Vehicles	11.4	16.8	22.2	23.8	25.7	27.1	28.7
State Vehicles (mostly small)	0.8	1.3	1.8	2.3	2.7	2.3	2.4
Trucks	2.3	3.6	4.9	5.3	5.6	5.5	5.9
Buses	1.1	1.5	1.9	1.8	1.9	1.9	2.1

decreases in the intensity of vehicular use) in the transport sector,* though one must also be aware of basic data inadequacies.

Important changes have also occurred in the residential sector. Over the decade there was a pronounced trend away from fuelwood towards the use of petroleum derivatives for cooking as shown in Table 2-12. This phenomenon would appear to be more closely linked to urbanization (the urban population growth rate is about twice the total population growth rate) than petroleum derivative prices.

Industry presents a more ambiguous picture. The structural shift in the economy away from agriculture towards industry (which is more energy-intensive) in the national accounts has been slight, and most of this had occurred by 1976 (Table 2-13). In addition there is no clear evidence of a shift towards more energy-intensive industries within the industrial sector though little analysis of this was possible.

A rather common point of view in Honduras is that there is little price elasticity of demand for petroleum derivatives. This viewpoint may have contributed to the rather passive government posture towards pricing. Taxes on petroleum derivatives are quite small overall and do not appear to have changed since 1973 at least. About 70 percent of Honduras' tax revenue is from indirect taxes and of this about 2 percent are from taxes on petroleum derivatives.[28/] Price policy is discussed in Annex A.

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* The simplified reasoning is as follows:

- o final demand for all petroleum derivatives was slightly higher relative to GDP in 1980 than in 1970
- o transport's share of this final demand is approximately stable
- o the number of vehicles, of all classes, has gone up sharply relative to GDP.

Table 2-12. Changes in Residential Fuel Use for Cooking--1970-1978

	Unit	1970	1978
Total households	thousand	415.5	516.1
Households consuming LPG or kerosene for cooking	thousand	42.6	121.0
Percent of Households consuming LPG or kerosene for cooking	Percent	10.3	23.3
Households consuming LPG or kerosene for cooking in relation to GDP	Households per million 1966 lempira of GDP	32.8	64.3

Table 2-13. Contribution of Productive Sectors to GDP

Selected Years 1970-1982

	1970	1973	1976	1977	1978	1979	1980	1981	1982(e)
griculture	31.3	31.3	27.0	25.6	25.8	26.0	26.1	26.2	26.8
anufacturing	13.1	12.8	13.7	13.5	13.8	13.9	14.6	14.8	14.8
ther industry	6.3	6.7	6.8	6.6	6.9	7.3	7.3	7.0	7.0
ervices	49.3	49.2	52.5	54.3	53.5	52.8	52.0	52.0	51.4

ource: Banco Central de Honduras, Departmento de Estudios Economicos.

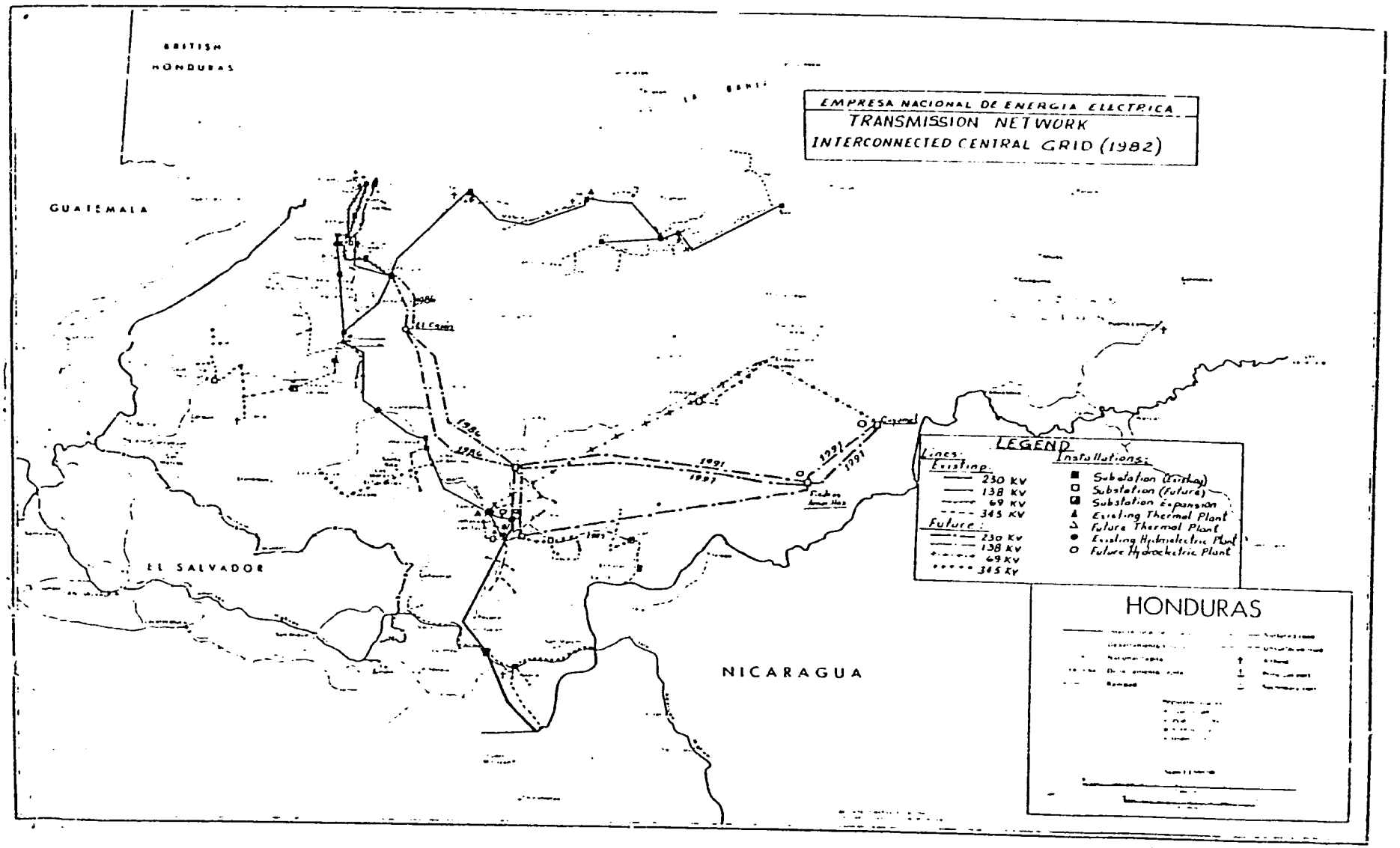
ote: Other industry includes mining, construction, electricity, water and gas.

The Electrical Sector

Due in large part, to the orientation received at the outset, the electrical sector has not received the same attention as petroleum fuels (some additional analysis is presented in Annex B). As already noted, there has been a trend towards substitution of thermally generated power on the grid by hydro, a trend which will continue. The 300 MW El Cajan dam (roughly equivalent to the entire installed capacity today) is due to come on line in 1986. For a few years after the dam comes into operation, there will be substantial over-capacity for which the marginal cost of use is virtually zero. In the near term, the utilization of this excess hydro capacity in a manner which does not permanently distort the pattern of demand (as would, for example, electric boilers which require very low tariffs to be competitive) is a major planning challenge in Honduras as in many countries in Latin America. Components of two of the projects proposed in this study touch on different aspects of this problem.

A final noteworthy aspect of the electrical system in Honduras is the limited coverage of the grid. The present grid (Figure 2-2) is restricted to the central axis of the country and one-half of the northern coast. Most of the country lies off the grid and is likely to remain so. As noted in Annex B, the state electricity company has shown relatively little interest in rural electrification. This implies that decentralized power generation will continue to have an important role even if it is quantitatively small.

Figure 2-2. Interconnected Central Electrical Grid



Chapter 3

The Institutional Context

In this section we review briefly the role played by, and some characteristics of, the most important institutional actors with regard to energy issues in Honduras. We begin with Honduran institutions and then discuss the international institutions.

Honduran Institutions

The most striking characteristic of the organization of the Honduran government when confronting the energy problem is the extreme dispersion of functions and the lack of a leading agency. There is not anything like a "Ministry of Energy." The lack of a leading agency is a generally recognized problem (for example, References 2, 3, 4). It has been recognized at least since 1979 (ref. 1(c)), when detailed plans were made for the creation of both an energy ministry and a national energy commission. There appears to have been little if any real movement towards greater integration of policy making and execution. The international donor agencies have not used their potential leverage to stimulate such a movement (as, for example, was done in Costa Rica), and may have exacerbated the problem with ad hoc project financing. If the political momentum to form a strong, relatively centralized energy agency could not be created during the height of the "second energy crisis" in 1979-81, then it may not be reasonable to expect such momentum to emerge from the internal Honduran political process now that oil prices are lower and stable and there is heightened military/ political tension around the country's borders. Our judgement, and that of everyone we have queried is

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* For the record, a ministry of energy was actually decreed by the military junta but never implemented (see Reference 1).

that such momentum is unlikely. Indeed, even significant improvements in coordination are likely to require the exercise of leverage from international agencies acting themselves with greater coordination than they have in the past.

In addition to excessive dispersion of function, other problems tend to limit the effectiveness of the response by the government. These include:

- a tradition of poor cooperation between government agencies especially at the level of project execution;
- generally thin (or non-existent) capacity for energy-related planning and policy-making in the various agencies; and
- generally high turnover of key personnel and accompanying short institutional memory.

In this report, existing institutions involved in energy-related matters have been categorized to divide these activities into six classes as follows:

- price setting;
- direct investment (within government), targeted credits and accompanying project/program analysis;
- tariff and tax policy;
- broader sectoral policy analysis;
- technical assistance to the private sector and accompanying R&D; and
- regulation, standards, and physical controls.

Price Setting

This activity is generally regarded as crucial in permitting the central government to transmit energy-related objectives to the multitude of public and private decision-makers. Energy price setting involves considerations both of cost (e.g., price of crude oil, refining, and shipment) and of taxes and subsidies, which may be instituted for a variety of reasons (e.g., to increase government income, improve social equity, or stimulate a change in energy supply or demand).

The pricing of petroleum products and electricity are undertaken separately by different entities; however, the composition of these entities is very similar. For the setting of electricity tariffs, the technical work is managed by the planning department of ENEE with final approval by the "Junta Directive" of ENEE and then the President. For the setting of petroleum product prices, the initial technical work and negotiations with the private sector are performed by the "Oficina Comercializadora de Petroleo" in the Ministerio de Economia which also includes the Banco Central de Honduras and the Ministerio de Hacienda (Treasury). Final price setting and approval comes from the "Cabinete Economico" followed by a rubber stamp from the "Comision del Decreto Ley No. 91." The following are the members of the final approval groups for energy prices:

<u>Electricity: Junta Directiva of ENEE</u>

Ministerio de Comunicaciones, Obras Publica y Transporte
Ministerio de Hacienda
Banco Central de Honduras
CONSUPLANE
Ministerio de Recursos Naturales
General Manager of ENNE
Consejo Hondureno de la Empressa Privada

<u>Petroleum: Cabinete Economico</u>

Ministerio de Hacienda
Banco Central de Honduras
CONSUPLANE
Ministerio de Communicaciones, Obras Publica y Transporte
Ministerio de Economia
President of the Republic

As can be seen, four institutions are involved in both electricity and petroleum pricing (See Annexes A, B, and E for more details on the pricing process and capabilities).

<u>Direct Investment, Targeted Credits and Project Analysis</u>

Governments can influence energy supply or demand through direct investments by the government (or by parastatal agencies) or through preferential credits targeted for relevant private sector activities. In either case, project analysis that incorporates energy concerns is necessary

to optimize these investments. In general, government activity of this type other than direct investment in electricity supply and road infrastructure is small or non-existent.* This limitation on government analysis, credits or direct investment could have significant consequences because private commercial loans carry a real rate of interest of at least 9.5 percent per annum[5/] which could inhibit some otherwise viable investments, especially in less familiar applications in the context of a weak private sector.

Current institutional involvement in these issues is outlined below for each energy sub-sector:

- Electricity Supply--The great bulk of investment for public distribution is made by ENEE, though in a few cases this investment is made by municipalities or even private enterprises despite the nominal ENEE monopoly. Although ENEE's investments are large and there is a substantial planning staff, the general impression is that planning for capacity expansion is not well developed (see Annex B). As in the case of electricity pricing, ENEE acts virtually autonomously, but is heavily influenced by international donors.

- Hydrocarbon Exploration and Refinery--This activity is dominated by private foreign capital. A modest exception is the identification of coal reserves.

- Fuelwood Supply--Fuelwood supply today is an activity with few investments, and almost none in tree planting (the major investment requirement). This may begin to change as an outcome of the AID-ROCAP sponsored Proyecto Lena. Tree planting would be a necessary component of any program to supply a significant fraction of the nation's energy requirements from fuelwood on a longer term basis.

- Forests and Tree Planting--Virtually all forest activities are subject to control by the Corporacion Hondurena de Desarrollo Forestal (COHDEFOR) and virtually all forests and trees in the country belong to the state, acting through COHDEFOR. From this perspective, all planting would be a direct public sector investment except where special exceptions are granted (as with the AID Natural Resources Management Project). It is generally realized that this law of universal tree ownership elaborated in

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* In the case of agriculture, an institutional infrastructure exists which could eventually be applied to these needs.

1974 when planting was not yet a serious issue, is inappropriate when applied to plantations (e.g., ref. 10). Reform of the law is a necessary precondition for widespread private sector planting, and this reform appears to be a high political priority for the next few months. This reform implies as a consequence some form of institutional mechanism for providing incentives to private sector investments in planting; however, the form these incentives will take is not yet clear. Tax incentives appear to head the list, though experience in other Latin American countries suggests that a credit line would be preferable, especially if the objective is to include smaller farmers. Regardless of the form, crucial steps in the approval process are likely to remain in COHDEFOR. COHDEFOR is still virtually without planning or evaluation capability for industrial fuelwood projects though piecemeal improvements are being made in this regard through a series of small FAO projects.

- Investments for Energy Saving Equipment or Fuel Substitution In Industry--For the private sector essentially all credit is from private commercial banks. The World Bank has established a line of credit for industry in the Central Bank of Honduras, FONDEI, which is passed through commercial banks. This credit line, however, appears to be limited to new industrial ventures and would not be available for retrofits. The CDI has a credit line from the IDB for small industries, but it is too small ($250,000) to be of much potential significance. Some industrial enterprises are controlled by CONADI, a parastatal holding company. CONADI's financial situation is very precarious now as a result of poor investments and management. It is under a political cloud and is virtually paralysed.

- Investments In Transport--For the private sector all credit for transport equipment is from commercial sources. Essentially all road freight and passenger transport is in private sector hands. The state, besides its own fleet of vehicles, owns most of the railway system (Ferrocaril Nacional de Honduras). As can be seen in Table 5-1, investment in the railway as of late 1982 was essentially zero. Investment in road, port, and airport infrastructure is a state responsibility. About $63,000,000 per year, or 12 percent of the total fixed capital investment (30 percent of public sector investment) went into infrastructure in 1982. Except for port infrastructure, all investments are made by the Ministerio de Comunicaciones, Obras Publicas y Transporte (SECOPT). Approximately 70 percent of the financing comes from foreign sources (Table 5-1). Despite the relatively large investments there appears to be negligible project planning capability with respect to energy consumption.

- Investments In Agriculture--There is an official line of credit for agricultural investments (the Banco de Desarrollo Agricola). However, machinery is a very low priority in the agricultural sector, and official interest can be generally described as dormant (see Annex C).

Tariff and Tax Policy

It was not possible to explore this area in any depth. Tariffs are set by the Ministry of Economy's Division of Foreign Commerce. Taxes are set by the Ministerio de Hacienda (Treasury Department). There appears to be little connection between either of these and the petroleum derivative pricing function within the Ministry of Economy, despite the close connection between taxes on fuels and fuel-using equipment (e.g., Reference 7).

Broader Sectoral Policy Analysis

At the broadest level we find CONSUPLANE, the Ministry of Economy and to a lesser extent the Central Bank involved in energy-related sectoral policy analysis. Staffing for the latter two is very limited (see Annex E). CONSUPLANE will have significantly improved staff capability within a year as personnel return from long-term training. It appears to be the only organization to have invested heavily in staff training. There appears to be considerable rivalry between CONSUPLANE and elements in the Ministry of Economy. CONSUPLANE has a rather marginal role in energy planning, apparently a rather common pattern in Central America (in contrast with many South American Countries). The Energy Office of CONSUPLANE, however, perceives its role as a leader and catalyst, rather than as a more conventional planning agency laden with targets, projections, and systems-type problems. This self perception seems well suited to the decentralized planning environment which is virtually certain to prevail. Although negative views are often expressed with regard to CONSUPLANE, it is emerging as one of the very few points of relative strength, and it could grow in effectiveness as other agencies become more competent. The modest, rather agile and eminently realistic attitude towards "central planning" which prevails in the Energy Office is rare. With

appropriate support from international donors this low profile approach could be seen as a strength.

At the sub-sectoral level, policy-making capability is relatively weak for electricity, no more than embryonic for forestry and fossil fuel supply, and virtually non-existent for industrial, agricultural and transport demand.

Technical Assistance to the Private Sector and R&D

This capacity is generally very weak. In a few areas, foreign assistance is building or may build up this capacity slightly:

- the CATIE/COHDEFOR work on reforestation
- the FAO/COHDEFOR work on charcoal and gasifiers
- ICAITI/CDI work on traditional wood using industries
- the AID Rural Tecnologies Project/CDI work on more efficient wood stoves, gasifiers and simple irrigation systems.

Regulations, Standards, and Physical Controls

Use of these tools is very limited and what few attempts have been made have failed or had minimal success. It is doubtful that the World Bank's petroleum geology loan will significantly alter the government's capability. The ICAITI industrial conservation project so far seems to be actively seeking to avoid a significant public sector involvement or an increase in public sector capability (more on this later). In addition, relatively little advantage has been taken of the training opportunities.

If one looks at institutional capability as a matrix matching function (e.g., pricing policy, technical assistance, etc.) with the energy supply and demand sectors, most of the matrix is blank, or nearly so, indicating either that capability is weak, or that it is not exercised. Including the private sector does not change the picture very much.

One set of institutions which is rarely discussed in the context of serious energy work in Latin America is centers of higher education, especially the universities. In Honduras, as elsewhere, the tendancy is to treat the university as an isolated academic island, a tendency exacerbated by the dissident nature of university politics. The isolation of the university appears to us to be a luxury which a society so lacking in professional talent can ill afford. The UNAH, National Autonomous University of Honduras, for example, represents a pool of professional talent equivalent to any government ministry (but potentially more flexible) and far greater than any private sector organization. Two institutes of the UNAH were visited and the general impression was favorable. The university itself seems receptive of late to participating more actively. In Costa Rica, Meta Systems has had a very satisfactory experience working with staff from a university-type institution despite political unrest in that institution. The team strongly urges that AID consider using the university, even if this involves developing some new institutional frameworks. This positive view seems to be broadly shared by Peter Deinken, the team's contact person at the mission.

International Donor Activity

Official development assistance is concentrated in the conventional electrical sector as should be apparent in the CONSUPLANE list of major activities (Table 3-1) including loans for El Cajon and other central station generating capacity, transmission, and rural electrification.

Other projects with significant funding are listed in Table 3-2. These include information for delineation of petroleum geology (World Bank),

industrial energy conservation (ICAITI/ROCAP), fuelwood with a heavy emphasis on traditional rural uses, and basic small-scale forestry work (various donors).

There is relatively little funding for broader policy-oriented work. At present, only the World Bank has approved funds for this, though the OLADE "Prodeca" program (IDB financed) will partially change this situation. The field is far from saturated and with a certain effort to coordinate (preferably via CONSUPLANE) and to maintain project flexibility, duplication should not be a major problem. Some relationships of proposed projects to existing activities will be discussed in Chapter 5.

Table 3-1. CONSUPLANE, Departamento de Cooperacion Tecnica Internacional Principal Energy Sector Projects (27.6.83)

	Duration	Value Million US$	Source of Funds
1. Centro de Despacho (Construccion, Centraliz. de energia)	81/84	2.3	OPEC
2. El Cajon Hidroelect.	8-/85	650.0	Various
3. Planta Tecnica No. 2 Puerto Cortes	82/84	26.2	France
4. Unidad Canaveral II	83/84	12.9	Japan
5. Transmision Nispero-Santa Rosa	83/85	3.8	BCIE
6. Linea Trans. Teguicig-Danli	83/84	4.0	Ptmo.
7. Interconex. Honduras-El Salvador	83/84	3.6	Ptmo.
8. Madera para Energia	82/84	0.4	UNDP
9. Produccion de Biogas para Energia Rural	82/83	0.051	FAO/UNDP
10. Restauracio n Energia Electrica en Tegucigalpa	82/84	1.8	AID
11. Tecnologias Rurales	79/83	8.9	AID

Other projects with significant funding are listed in Table 3-2. These include information for delineation of petroleum geology (World Bank), industrial energy conservation (ICAITI/ROCAP), fuelwood with a heavy emphasis on traditional rural uses, and basic small-scale forestry work (various donors).

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Table 3-2. Major International Donor Activities in Energy, With Emphasis Outside Electricity

Donor	Activities (Honduran Counterpart in Parentheses)
Interamerican Development Bank (IDB)	Financial support for OLADE
World Bank	Oil exploration loan (Ministerio de Recursos Naturales) sub-loans: oil pricing study (Ministerio de Economia) alternative energy sources (CONSUPLANE) Scheduled Energy Sector Assessment Mission
OLADE	"Prodeca" program covering a broad range of energy subjects (planning, interconnections, etc.) for the isthmus, not yet fully defined or approved
UNDP/FAO	"Madera para Energia" (COHDEFOR) investigating aspects of wood use for industry
RCCAP/CATIE	Projects Lena (COHDERFOR) concentrating on small scale tests and some diagnostic work
ICAITI/RCCAP	Projects Lena (CDI) rural wood-using technologies, Energy Conservation in Industry (no counterpart)
AID/HONDURAS	Rural Technologies Project (CDI includes wood using technologies for rural areas, Rural Electrification in the Aguam Valley (ENEE)

Chapter 4

Targets of Opportunity

The objective of this chapter is to outline briefly various concrete "targets of opportunity" that would:

- decrease demand for petroleum derivatives;
- diminish the adverse ecological impacts of fuelwood consumption; and
- decrease future investment requirements for electricity generation and distribution.

These targets are not systematically justified nor are they exhaustive. Their treatment was conditioned by the contacts made over a short period of field work, by broad guidance from AID, and by the knowledge that a more ample World Bank Country Assessment team will visit Honduras later this year. Many of the actions discussed will be developed as possible AID projects in the next chapter.

- Conservation of oil derivatives in industry is a well recognized alternative for which significant funding is coming from several sources. The potential savings have been estimated at 11 percent for the region as a whole, but this figure is little more than a guess. This subject will be treated in more detail in Chapter 5.

- Substitution of oil derivatives used for process heat with electricity. With El Cajon coming on-line there is likely to be a significant excess of available hydroelectric capacity for a few years. Although little thought appears to have been given to this option in Honduras, work in Brazil and Costa Rica, which face similar situations, suggests that there could be cost effective substitutions, even of a temporary nature, if the institutional arrangement is correct. One interesting arrangement being seriously considered in Brazil is for the electric company to own electric boilers, physically located in the consumers' plants. The utility would sell to the plant steam produced with electricity whenever the overall electrical supply/demand situation indicated that this would be economically advantageous. Later, when new electrical capacity is needed, the utility could continue to sell steam to the plant--except that the steam would be produced from

biomass or coal in a cogeneration cycle along with electricity. The same institutional arrangement could thus serve two distinct situations. There does not appear to have been any study as yet of how such a substitution could be carried out and what it could achieve. There may also be some potential substitution of petroleum derivatives by electricity in the residential/commercial sector.

- Switching from diesel oil to fuel oil for process heat applications in the industrial sector. As shown in Table 2-3 the industrial sector consumes an unusually large quantity of diesel oil, both as a fraction of total diesel consumption and relative to fuel consumption. There are three possible reasons for this high imputed consumption of diesel oil, each with radically different policy implications. The three possible causes are:

  1. a rather large use of diesel for off-the-grid stationary motive power, as in saw mills, the shrimp processing plants on the islands, and fishing boats. In this case derivative switching would be largely inapplicable.

  2. inclusion of consumption by mobile in-plant vehicles and transport vehicles owned by the industrial firm. We have received conflicting judgments from technical personnel involved in the Energy Balance project as to the extent to which this factor is important.

  3. relatively large use of diesel for process heat in industry, especially in smaller industries. If this hypothesis is correct there could be scope for a rather rapid transition of significant industrial fuel consumption from diesel to fuel oil. The reason we suspect this is based on more detailed Costa Rican experience where we have found, for example, considerable numbers of small diesel package boilers. Honduran industry is likely on average to be even smaller scale than Costa Rican and as such more likely to use diesel.

All three reasons are in fact probably true; what we have not been able to determine (and probably cannot be determined for some time) is the relative weight of each.

Technology exists in Central America to convert (at low cost) small diesel boilers and some other process heat applications to fuel oil. If it is true that considerable amounts of diesel are still used in applications susceptible to switching to fuel oil, an interesting question emerges regarding the

technical competence and/or financial capability of the private sector to make rather simple adjustments unassisted, a question with some rather broad implications for policy. The objective suggested here does not save petroleum *per se*, but shifts consumption to a lower-cost derivative which in the context of the San Jose accord is desirable because not enough fuel oil is consumed relative to other derivatives.

- As already noted above, the use of diesel for shaft power may be quite large in industry. This is probably due to the limited coverage of the grid. Since the grid is unlikely to be extended rapidly, this suggests a potential for substitution with stationary engine gasifiers using wood or charcoal (e.g., in saw mills).

This market would be technically easier than rural electrification. Unfortunately, neither the size of the market nor important characteristics influencing near-term economic/technical viability (e.g., size, load factor and distribution) are known. The use of gasification technology in the agricultural sector for engines (e.g., irrigation pumps) appears to have very limited potential in the near term and is probably not worth pursuing further (see also Annex C).

- The use of wood, various biomass residues (saw mill wastes, corn cobs, rice hulls) and charcoal for process heat in industries currently using oil probably has considerable potential. The applications can vary from large-scale use in the cement industry to very small boilers (200-300,000 Kcal/hr). The range of resource/end-use options is quite large. There is fairly widespread agreement to be found in places such as CONSUPLANE and COHDEFOR that industrial process heat and perhaps shaft power, from biomass is an important, but poorly understood option. Our own work in Costa Rica, and also a World Bank assessment mission there, indirectly supports the view that considerable cost effective potential exists. However, while there are some small projects, no systematic effort has been made to study the market for various technologies and resources.

- By the late 1980's, cogeneration of steam and electricity for sale on the grid could be a significant factor influencing plans for expansion of electric generating

capacity. The advantage of a cogeneration strategy is that the investment cost per KW is lower than for hydro* and that the smaller units have a relatively short lead time while the planning/construction cycle for a large dam is about 10 years. The relatively high investment cost (El Cajon is costing $2,000/KW) and long maturation times required for large-scale hydro are a problem for a country that has scarce investment resources and a very uncertain growth future.

Even if there were an excellent data base and planning capability in Honduras, it would a thankless job to try to project with any precision what the country's electrical demand will be in 10 years. A cogeneration strategy complementing continued hydro development could provide cost-effective flexibility for system planning. The issues involved in developing such a strategy (including institutional issues) are complex. To our knowledge, virtually no work on the subject has been done. One promising area would be cogeneration in sugar mills with sales to the grid. There exist predecents for this in various countries in Central America. More ambitious plans are being considered in such major sugar producing countries as Brazil, the Dominican Republic and Cuba.

- There are probably significant opportunities for conservation in the transport sector, involving among many other things, more adequate sizing of freight vehicles, load consolidation and improved maintenance and operating procedures. In the next chapter, these options will be discussed at more length in connection with proposed action.

- Substitution in the transport sector does not appear to be very promising in general. The scope for electrification is very limited. The only fuel substitute available now, ethanol, is almost certain to be too expensive, though we had no time to evaluate this point in any detail. The failure of the Costa Rican large-scale ethanol program cautions against an ambitious sugarcane-ethanol program modeled after Brazil.

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* Small-scale hydro has small blocks of investment and short lead times, however, investment costs per KW of firm power tend to be even higher. Pursuing a cogeneration strategy should not effect the merits of small-scale hydro (a subject that was decided by AID/Contractor consensus not to be investigated in detail).

A small-scale program based on a cheap resource base such as spoiled bananas, however, could be interesting. The approach is being considered in Costa Rica. This fuel might be used in the local area in either gasoline or diesel engines. (Perkins and MWM diesels are being modified commercially in Brazil to use straicht alcohol.)

There are opportunities to diminish the adverse ecological impacts of fuelwood consumption.

In some areas of the country fuelwood use is creating increasingly serious ecological problems. One of the first functions of the ROCAP/CATIE project was to define critical areas. Although this work appears to have been largely completed, the published report was not available in time for this reconnaissance. Several generalizations, however, are possible. First, fairly serious problems are emerging in some of the more heavily populated rural areas such as the provinces on the western border with El Salvador/Guatemala. While it is not clear that fuelwood gathering is itself the main cause of the deforestation, the balance may have reached the point in some areas that collection is difficult and therefore, the local population is showing increasing interest in measures to conserve or plant firewood. At least one foreign donor (non-US) is in active negotiations on this regional fuelwood problem, while AID has a relevant program in the Chuluteca basin.

Second, some more concentrated fuelwood demands in traditional user industries are having adverse impacts in specific areas of the country despite the fact that industrial consumption of fuelwood overall is only 10-15 percent of residential consumption. The most serious problems appear to arise with the saltworks on the coast which are cutting the ecologically fragile mangrove formations. A similar problem in Costa Rica has been resolved in the last three to four years. The ICAITI portion of the ROCAP Proyecto Lena is designed to address this set of problems. One technical suggestion for the

lime industry may be useful. In Brazil over the last decade simple and reliable wood-gasifier-fueled calcining modules have been rather rapidly supplanting the traditional kilns. They have lower capital cost, allow greater quality control and significantly lower wood consumption per unit output and are substantially safer for the operators than many traditional techniques. With regard to Honduras the principal problems arising would be:

1) the smallest commercially available units (25 tpd output) are several times larger than the typical output of individual firms and would reduce employment per unit output. (On the other hand, with lower costs, output might expand.)

2) the gasifier unit would probably have to be imported (the market here is probably not big enough to support much fabrication).

In Costa Rica, the small lime industry's (7500 tons per year) main co-operative is trying to modernize operations and could be useful to watch.

A final set of problems emerges from fuelwood use for cooking in the larger urban areas. Lacking the ROCAP/CATIE diagnosis* it is not possible to attempt a worthwhile quantitative estimate for various urban areas, however, it is qualitatively clear that the cooking demand concentrated in a city like Tegucigalpa is generating rather serious deforestation problems. Indeed, it is likely that this is the single most important fuelwood/ ecological problem in the country. Despite general acknowledgement of the seriousness of the problem, there are no programs existing today which address it. The Proyecto Lena of ROCAP, in Honduras, has been concerned exclusively with rural areas, as has the improved stove component of the Rural Technologies Project. The Proyecto Lena could, in principle, be expanded to specifically address this

* The CONSUPLANE survey did not make an urban/rural breakdown.

issue, as was done in Nicaragua[6/], however the necessary funds have not been programmed. Various options exist to address the issue. Among them:

- diffusion of higher efficiency stoves, such as the Lorena stove now meeting with some success in rural areas;
- organized measures to bring in residues from further afield;
- plantations for fuel supply; and
- accelerated fuel switching (probably to kerosene or electricity).

These options raise many distinct policy and technical issues. Some may involve considerable financial resources which would seem to justify the eventual development of a distinct project. Such a new project would appear to be a natural expansion of current USAID Honduras priorities and reactions within the mission were quite positive.

Chapter 5

Recommended Projects

In proposing project options we have had two rather distinct audiences in mind, the Office of Energy in Science and Technology (Washington) and the USAID mission in Honduras. The Office of Energy is primarily interested in policy-oriented work starting in FY 1984. The mission is open to a broad range of activities. Though a "conventional" project could not be initiated before FY 1986 there appears to be the possibility that local currency funds (lempiras) deposited in the Central Bank as a result of emergency balance of payments assistance could be mobilized sooner. The issue of the availability of these "lempira funds" was never satisfactorily defined. A major constraint on the mission side appears to be the lack of qualified personnel to husband projects along now that Peter Deinken has left for El Salvador. This problem could be exacerbated by the LAC Program Office's desire that the mission refrain from projects in the Energy sector.

We begin by focusing on proposals for the Office of Energy, though the discussion is clearly relevant to the mission as well. A number of points have been made in the course of the work:

(1) there is in practice no central place in the government for co-ordinating the development of energy policy and there is little likelihood that such a central point will emerge soon;

(2) the various agencies acting in energy related areas have little or no capacity for developing sub-sectoral policy or for project evaluation. In many cases specific technical capability is also weak. Useful data bases are often inadequate or non-existent.

(3) most past and current foreign assistance does little to correct this, having emphasized expensive technical assistance with little regard to developing counterpart capabilities. We have identified only one project to date which significantly improved planning capability.

To this should be added a fourth important observation. Several well placed individuals (including ones from other international agencies) have emphasized that AID is probably the donor in the country most capable of taking significant steps to ameliorate the situation, perhaps the only one.

There is a broad consensus that the most fruitful target for technical assistance in the planning area is working directly with agencies responsible for specific subsectors to strengthen their capabilities. This implies technical assistance that emphasizes a diverse range of specific sub-sectoral skills rather than policy generalists. The emphasis should be on building planning capability within several agencies responsible for specific aspects of the energy problem rather than within a central agency or by tightly coordinating an overall effort. To use a metaphor, before building a platform for planning, it is useful to have the sawn wood. The director for energy planning in CONSUPLANE, probably the natural home for centralized energy planning in the absence of a Ministry of Energy, strongly supports this conceptualization of the basic strategy for the proposed project. One of the flaws of the Interagency Commission on Energy Conservation that has led to its current paralysis is that it started coordinating before there were any capabilities to be coordinated.

Two more points should be emphasized before turning to specific proposals. First, there should be an active <u>participating</u> counterpart for every major phase of project work. This has often not been the case, due in part to such things as donor restrictions on local personnel expenses and salaries, and in part to the need for very considerable "preproject" preparation if the appropriate counterpart is to be identified and liberated. In detailed planning for this project, considerable attention should be given to identifying the appropriate counterparts and obtaining commitment of their time.

The second point is that the coordinating agency for the projects should be CONSUPLANE, even if the bulk of the work is to be performed by other agencies. There are several reasons for this. A coordinating point within the GOH will be essential for maintaining project cohesiveness.* Our own work has identified CONSUPLANE as the natural home for such a role. In addition OLADE has designated CONSUPLANE as the coordinating point for Honduras. With the wide-ranging Prodeca project to be financed by the IDB** it is likely to become a significant actor.

The presentation which follows is organized around specific project, or sub-project, titles. The reader will note that in many cases the discussion goes beyond the project title; that is because there are strong interconnections. While this makes the presentation complicated, the interconnections are an important and desirable feature of the proposal.

The following areas of policy analysis are proposed as a basis for projects in Honduras:

1. industrial fuel substitution;
2. industrial energy conservation including development of an industrial data base;
3. urban cooking and fuelwood supply;
4. fuel pricing; and
5. energy use in transport.

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* The mission is unlikely to have anyone who will be knowledgeable enough to perform this task satisfactorily on staff in the near future.

** While not yet formally approved, this approval is expected.

Project No. 1: Industrial Fuel Substitution

Background

Industry provides a major opportunity for effective work, but this effort should be carefully coordinated with other projects which are now planned or underway. The main targets of opportunity are:

(a) switching from diesel to fuel oil in process heat,

(b) substitution of petroleum derivatives by hydroelectricity and biomass,

(c) conservation of fuel and electricity in industry, and

(d) perhaps, conservation and power generation in sugar mills.

Item (b) is being touched in part by the UNDP/FAO project "Madera para Energia", which should provide some useful site-specific information to build from. There is a good chance that CONSUPLANE will become involved in this subject with its loan from the IBRD (however, this loan is too small to carry out much useful work). There is also considerable interest within CONSUPLANE to look at item (d). In addition, IDB will soon begin to get out from under the workload of El Cajon and may be looking for projects such as item (d). IDB with its traditional involvement in overall power system development would have a comparative advantage over AID. For this reason we will eliminate (d) from further consideration with one exception; cogeneration of power from sugar mills (combined with conservation) could be an important option in a number of AID countries. With some catalyst (perhaps from ST/EY) it might become part of the ICAITI industrial energy conservation project in Central America. This possibility should be considered if other potential actors do not show signs of moving in the next few months.

Item (c) is in principle well within the domain of the ICAITI/ROCAP industrial energy conservation project.

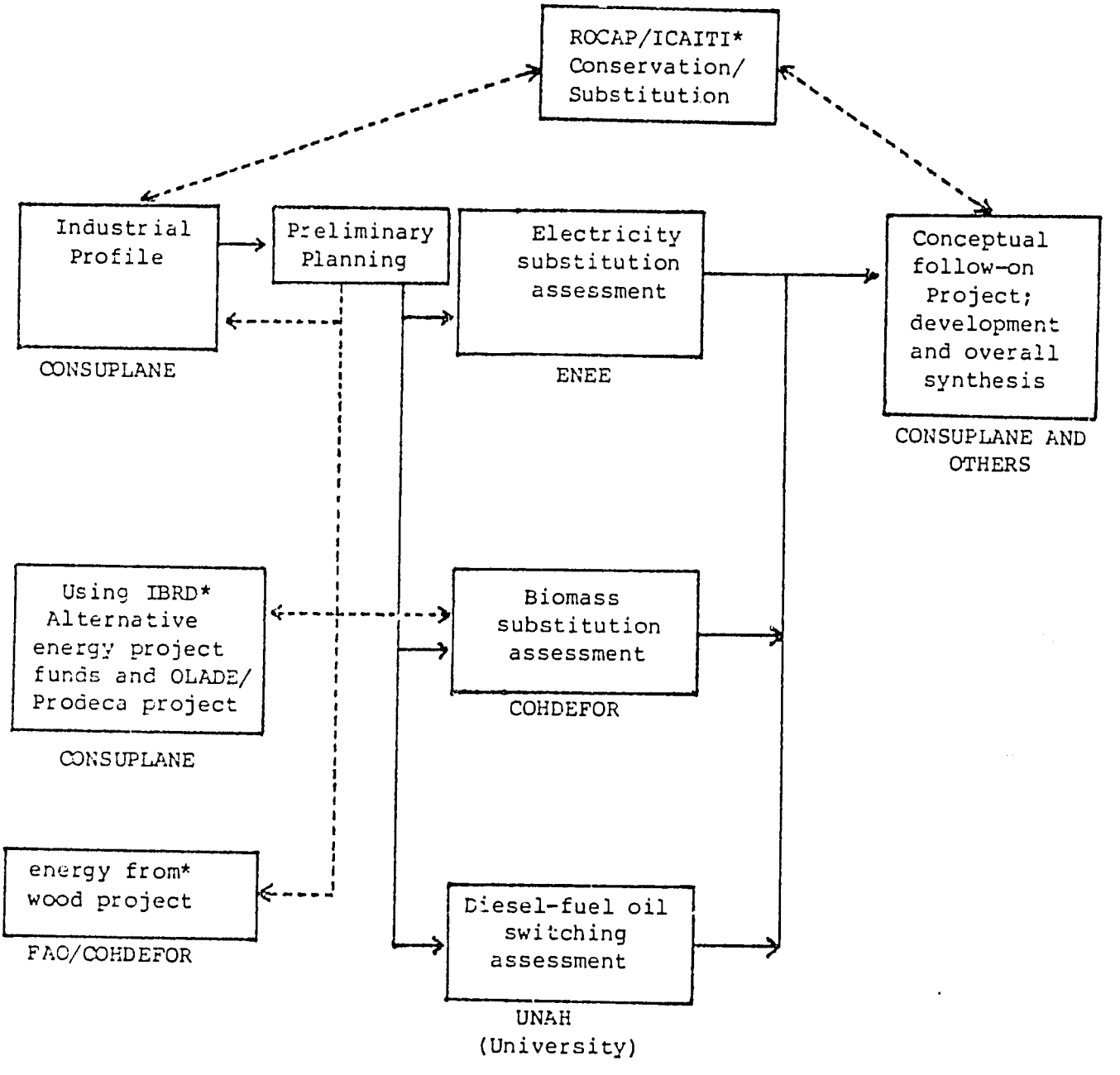
Project Outline

An overall schematic for the proposed industrial proposed project is shown in Figure 5-1, including how it might relate to other projects financed by ROCAP, IDB, FAO, etc. and possible national counterparts for specific components. Most of these projects are not well defined as yet, or if defined may be changed under force of circumstance (e.g., ROCAP). This is an important point. A number of actors are entering the area, no single one prepared to devote enough resources to do a complete job. An efficient AID project must be flexible in its terms of reference and allocation of resources to various components, because the environment of work will be changing. The velocity of such change can be inferred from the fact that the OLADE Prodeca project proposal to the IDB was not yet fully prepared in early August, but the project may well be underway by late January 1984.

ST/EY should invest resources in the first component of this proposed project--an industrial profile--if it acts at all in the area of industrial energy use because this profile is fundamental for both fuel substitution and conservation policy and because the ICAITI project has no provision for it. The component is to assemble from a statistical sample a profile of Honduran industry's physical characteristics.* This profile would not pretend to be an

* The profile would include type, scale and model of fuel-using equipment, load factors, equipment utilization/maintenance routines, types of processes, temperatures, pressures, use of heat exchangers, how heat is used, plant layout, and general level of energy management.

Figure 5-1. Interaction Graphic
For Proposed Industrial Fuel Substitution Policy Project



Notes: * Other project with which the proposed project interacts.

---------- lines of interaction.

National counterparts are shown under component box.

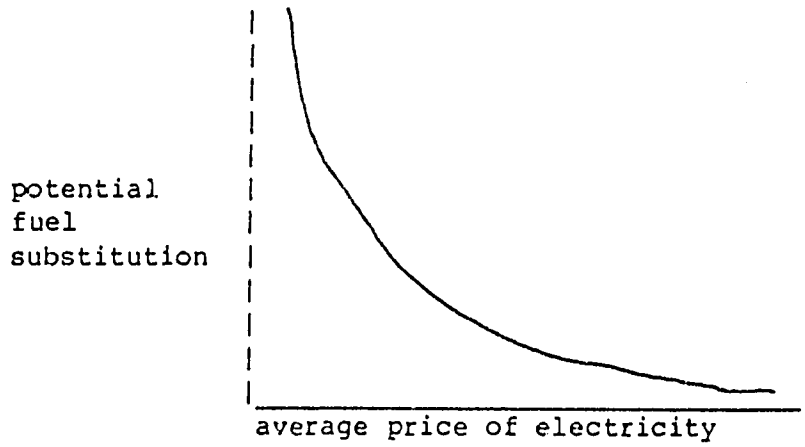
audit but would provide a host of information that does not exist today and could be used among other things to plan audit priorities and to evaluate fuel switching or fuel substitution options. The profile can be done with varying degrees of thoroughness.

Based on our experience in Costa Rica, but assuming somewhat greater attention to conservation related items and more reliance on professional staff as opposed to student labor, this would require about 6 man-months of local professional time and 8 weeks of foreign assistance to do between 100-150 plants. The overall cost would be about $30-40,000 assuming that all work was done with paid consultant time for foreign and local participants, but that the sample would be prepared by an agency such as CONSUPLANE.

This industrial profile would provide a basis for detailed planning of the three project components to follow, i.e., what industries to concentrate on and how to make the studies comparable. It would also provide a useful background for other projects in the country.

The three components, to be studied more or less in parallel, would look at the technical issues and economics of:

1. <u>substituting petroleum derivatives used for industrial process heat with electricity in industries which already are on the grid</u>. This would concentrate on the demand side of the equation, being a sensitivity analysis. It would, in effect, provide the basis to generate a "demand curve" with relation to oil (or any fuel) as a function of price. Thus, simplifying a bit:



This component would not be concerned with how tariffs would evolve, but it should provide a useful tool for tariff decisions.

2. substituting industrial fuel use with biomass resources. This would concentrate mostly (but not exclusively) on the supply of residues such as wood and rice husks as well as the costs of harvesting, transforming and transporting them, and the additional investment and operating costs required to use them. Good performance of this task would require up to date knowledge about what is happening in various technologies in the world. This component should also take account the practical problems associated with establishing a market for relatively unknown technologies. This assessment could be regional (within Honduras) rather than national in scope.

3. switching from diesel to fuel oil. This is the most straightforward of the three. It should also investigate why many diesel users have not switched despite the strong price incentives.

With the completion of these components would begin a synthesis of the results. This would compare the various alternatives (wood vs. electricity vs. other fuel switching) and look at broader issues (e.g. refinery balance, how electricity tariffs might evolve for industrial heat, etc.). This phase could provide the basis for a mission project paper. The recommendations could also provide the basis for actual investment studies and for hardware installation in the other projects which are available to do this (e.g. ICAITI, OLADE). If properly designed the proposed project should complement other activities in the area, and indeed galvanize some of them into less vague or ad hoc objectives.

Project No. 2: Industrial Energy Conservation and Development of an Industry Data Base

Background

Conservation in the industrial sector is clearly one of the major opportunities in energy policy. General recognition of this fact gave rise to the ROCAP funded project for Central America.

However, this project is not structured to provide a comprehensive profile of industry relatively early on of the sort that would be useful for planning fuel substitution by electricity or biomass as well as indicate some conservation opportunities. This sort of information can be obtained for a relatively large number of industries quite cheaply and represents a qualitative improvement in the basic information for a wide variety of project planning efforts. For this reason work of this sort was proposed as a component of the ST/EY project discussed above. Although it is generally recognized that conservation and substitution should be considered together in many Central American situations, the present plan does not seem to systematically work towards this objective.

Project Outline

The proposed project in Industrial Energy Conservation and Development of an Industrial Data Base would concentrate on complementing the ROCAP/ICATI project. (This effort could require some disbursement of funds, though these could largely be in local currency.)

The most urgent action for the mission is to work toward establishing an institutional base for the creation of a competent Honduran team integrated

within the overall project. At least part of this "counterpart team" should be based in the public sector.* Effective action in this sense is likely to require several measures:

1. strong pressure on ROCAP/ICAITI to shift a small part of the large staff build-up for ICAITI to a designated Honduran institution and to assure that access to training is comparable to ICAITI staff. The greater part of this shift might come out of the rather excessive promotional overhead as well as substitute for an additional ICAITI country representative.

2. discussions with Honduran government and industry about the best institutional home in this country for a technical team. Our personal preference is for some arrangement with the Universidade Nacional Autonoma. An institute that is attached to the engineering faculties of the University and allows non-University professionals to be hired on consulting assignments could provide access to a large pool of talent, while assuring good quality training of future engineers. The institute could take advantage of low cost student contributions to survey activities without becoming "academic". As our experience in Costa Rica is showing, this kind of activity can rapidly generate private sector spinoffs. Another strong candidate is ENEE; however, it is important that senior management give the idea serious backing. There are successful precedents both in the US (e.g., Southern Electric) and Latin America (e.g., Companhia Energetica de Sao Paulo) for broadening the orientation of electric utilities in this way when management is in favor. There are also examples of abysmal failures when its support is lukewarm. Other institutions which could play a role are CONSUPLANE and CDI. It would be premature to move further toward institutional definition before AID has broadly decided to act. The point is that reasonable possibilities exist.

3. the allocation of funds by the mission to support some institutional costs. Because of possible delays or problems with the reallocation of ROCAP/ICAITI funds implied by (1.) above, the mission could provide funds for two Honduran professionals for two years (or 48 man months) with some back-up, as an interim measure. This would cost about $100,000. Almost all of this would be in local currency and might be financed on relatively short notice by the ESF funds in the Central Bank. ICAITI in turn could release comparable funds for staff and some travel money, and could assure access to training and technical assistance from Georgia Tech similar to that being given to ICAITI staff.

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* The entire META consultant group is in strong agreement on this point.

The local component of the survey work on the industrial profile could be an excellent, low-risk, real-world training ground for a couple of engineers and would, incidentally, make them very desirable counterparts for the ICAITI/ROCAP project. This local component of the ST/EY project could be beefed up at relatively low cost with precisely this objective in mind. Perhaps the mission's local currency funding could pay for this. A side benefit of this deepening could be a survey of the small industry sector. In the 1975 Industrial Census, firms consuming less than 500 barrels per year used only 10 percent of the fuel consumed by industry but accounted for 85 percent of the registered firms.[24/]

Project No. 3: Urban Cooking

Project Outline

As mentioned in an earlier section, the role of urban fuelwood use for cooking is a subject of major interest, on which little work is presently being done. The USAID mission appears to have considerable interest in eventually carrying out work in this area, including loans. Possible targets of action are, however, quite diverse--ranging from improved wood cookstoves and fuelwood plantations, to an accelerated shift to kerosene or electricity--and can imply very different kinds of action. Before there is any significant investment in any of these options, a careful analysis of the whole issue should be made. This analysis should compare the costs, time lags, institutional problems and other characteristics of these options, and develop a coherent program strategy that would be the basis for a subsequent mission or ROCAP Project Paper (PP).

It is possible that this program development work could be financed, all or in part, from existing mission/ROCAP projects and with local currency funds in the Central Bank. This possibility should be seriously considered, especially for certain parts of this work. At the same time, a strong case can be made for at least partial financing (especially foreign currency funding) by ST/EY:

(1) It may not be easy to change existing projects. For example the project officer of the Rural Technologies Project had some difficulty with the idea of spreading that project's mandate to explore the use of Lorena stoves in urban as well as rural areas.

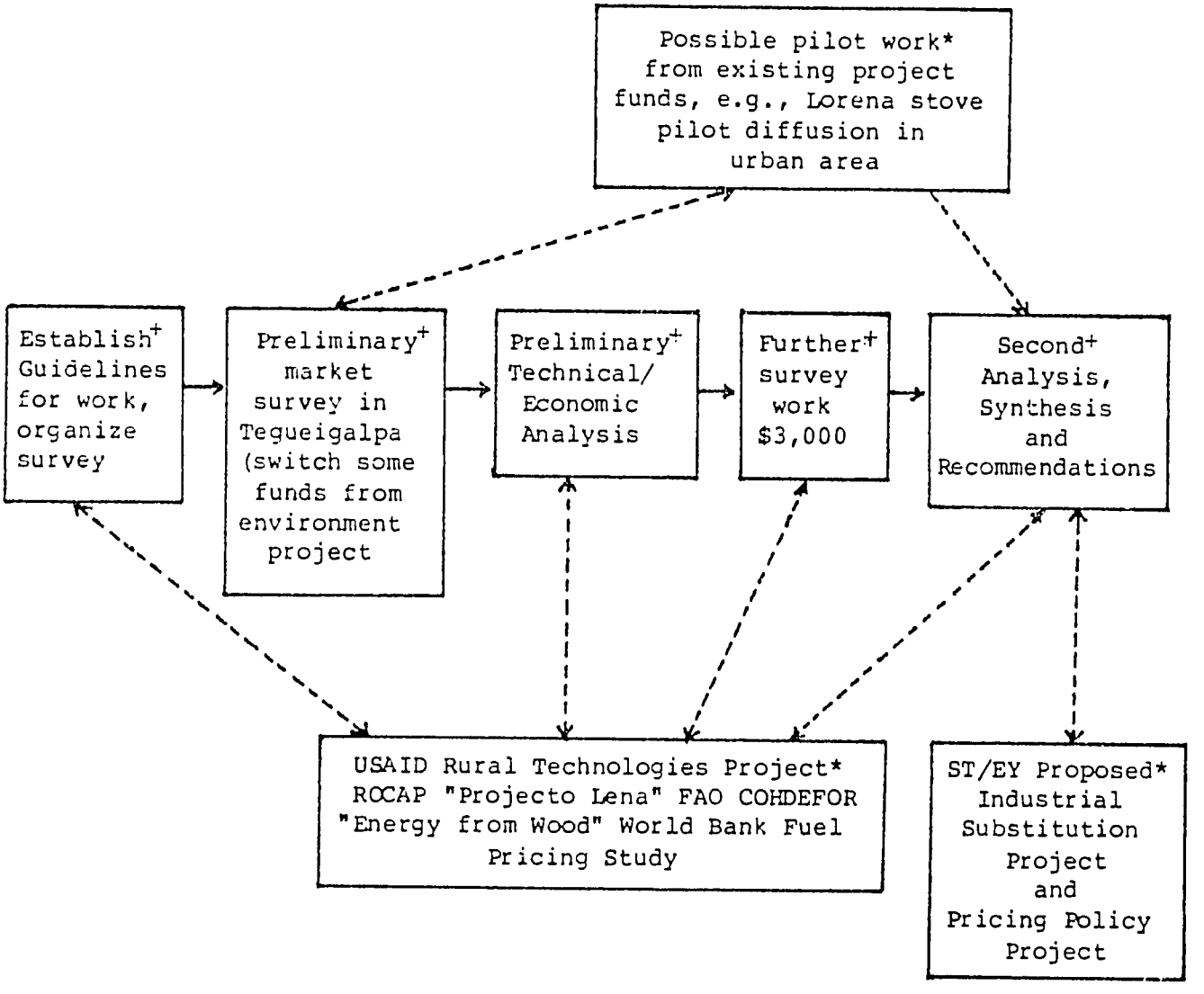
(2) The urban areas and their problems are rather distinct from those encountered in rural areas, and rural areas have received the bulk of the attention so far.

(3) The limited work in the region on the subject to date has tended to focus on one or two options, and to almost ignore the competition between kerosene/LPG/electricity/wood. (e.g. the Managua fuelwood study, Reference 6). This competition is very important; for example, preliminary calculations done with CONSUPLANE suggest that kerosene is already cheaper than purchased fuelwood. ST/EY funding could help assure adequate and competent treatment of this subject.

A schematic of a possible project is shown in Figure 5-2. For the sake of argument, it is envisaged that ST/EY would fund the core of the project, about 4.5 man-months of foreign consultant time plus travel, and about half the most essential local survey effort (total survey work would be about $6-8,000).

CONSUPLANE has expressed considerable interest in this work, and it seems reasonable to expect that the foreign consultants would have counterparts assigned full time, and that most of the labor intensive load of detailed organization and execution of necessary surveys would be lifted from their shoulders.

Figure 5-2. Interaction Graphic of Proposed Urban Cooking Project



+ To be done with CONSUPLANE/COHDEFOR
* Other projects with which the proposed project interacts.

This policy and program development work for urban cooking fits in rather well with the industrial substitution policy proposal for ST/EY outlined earlier. Both residential cooking and industry make important trade-offs between electric-thermal applications, petroleum derivatives, and woody-biomass. The study of each sector can relate to the other. There is, for example, the simplistic but commonly raised question--"How can you talk about substituting petroleum in industry with woody biomass while there is a problem of supplying fuelwood for cooking?" There are answers, but it is noteworthy that no one has yet studied the two sectors side by side. Beyond this there are more specific questions involving comparisons. For example:

- Would it be more cost-effective to plant fuelwood or use residues from such things as sawmills for industry and/or urban cooking demand?

- How does substitution by electricity compare in the industrial and residential cooking sectors? What might be the implications for tariff policy at a time when hydroelectricity capacity will be in excess?

In a country such as Honduras with its hydro and biomass resources on the one hand and its widespread but inefficient use of fuelwood for cooking on the other, it seems to make a great deal of sense to consider the industrial and residential sectors side by side. The two proposed projects would reinforce each other and should be developed together with this in mind.

Project No. 4: Price Policy

Background

Price policy is a very important part of overall energy policy. For this reason, the reconnaissance team's strategy was designed to look carefully at what work might be funded in this area.

The discovery of the existence of World Bank funding for a pricing study to be carried out in the Ministry of Economy in the near future (consultant bids are now being evaluated) made it impossible to make any wide ranging proposals for work. The characteristics and terms of references of the World Bank project are discussed in Annex D. We are not convinced that the World Bank project adequately satisfies Honduras' needs for policy work in this very important area. To begin with data availability is not good; there is no Input-Output model (a standard tool used in other IBRD-funded pricing studies) available for Honduras, (e.g., Reference 27). Given the apparent heavy bias towards an expensive foreign consultant package in the World Bank project it is doubtful that it will be able or can afford to develop much of the essential underlying information. Some useful analyses may not be done as a consequence. In addition there seems to be very little development of the Government of Honduras' capability in the area.

Project Outline

The already proposed industrial and residential work can result in conclusions which are of considerable interest for petroleum and electricity pricing policy. If resources permit, it would be desirable to extend this effort towards building a data base and developing analytic capability. For example, it might be possible to complete the basic I-O table work, which was begun at the Ministerio de Hacienda but appears to have been officially discontinued, and to review the impact of existing taxes on different income classes. This work could be integrated with that in the other industrial and residential energy projects and provide an opportunity for a partial review of issues likely to be raised in the IBRD pricing study. This would help to

institutionalize an ongoing capability to develop energy price and tax policy in the Ministry of Economy (which will probably have the major staff role for the Pricing Council). A possible outcome of this work could be a simplified pricing model capable of being updated. There is a wide consensus that such models are feasible and are useful tools.

No budget was sketched out, in part because this would depend upon a clearer idea of what the World Bank's pricing study will likely achieve and how the reorganization of the pricing policy process may effect counterpart capability. Both of these points should be better understood within two months. The total cost should not exceed $80-90,000, including the development of a simplified pricing model (if such a model is not developed by the IBRD's pricing study) and work on an I-O matrix, and the cost to ST/EY might be substantially less.

The total cost of such a component need not be high to be useful. It starts by benefitting from the analyses conducted in the projects proposed here for industry and urban cooking. It would help to develop "policy-oriented" recommendations as opposed to the more "project-oriented" recommendations in the industrial and residential sector work. This component could complement the others by following them (preferably with some overlap), if budgetary or other constra nts favored this.

Although the current state of affairs seems inadequate, the reorganization of the pricing policy process (Annex A) suggests some GOH interest in greater visibility and capability, which in turn suggests a more promising environment for technical assistance.

Project No. 5: Transport

Background

The transport sector is the most important consumer of petroleum derivatives in the country. If public sector vehicles are included, it probably accounts for more than half the final petroleum demand. In addition, as should be evident from the institutional analysis, planning capability with relation to energy use in transport is severely limited.

This would appear to argue for policy-oriented technical assistance in the transport sector. There are, however, a number of problems which lead us to the conclusion that technical assistance in the area is not presently advisable, at least within the broad terms of reference for this reconnaissance. What should be seriously considered is a rather different strategy for technical assistance in the energy/transport area. Let us begin with some of the problems.

It is important first to recognize that active planning in the area is essentially non-existent. The one attempt by the Interinstitutional Energy Commission[23/] that emphasized policy measures was conceived in an *ad hoc* way and was poorly received. As a result, the commission itself is now essentially inoperative. The equivalent of the ministry of transport (SECOPT) which everyone agrees is the key agency to deal with, does not have a single person paid to think about energy and transport. The development plan for the transport sector emerging from CONSUPLANE mentions energy once--and then only with regards to conservation in the railways! To cite another example, there has been no adjustment of taxes on different petroleum derivatives since before the "energy crisis" began in 1973.

Seventy percent of the transportation sector investments are financed by international lenders as shown in Table 5-1. This percentage is likely to increase. The IDB, IBRD, and CBEI are all considerably more important sources of funds than AID which seems to have restricted itself to rural road programs. Despite the predominant role of these lenders and their greater past involvement in energy/transport issues (e.g. References 7, 22), they do not appear to have financed a single planning effort in the last several years that goes much beyond "what kind of road do you build from A to B." The last technical assistance to SECOPT on economic evaluation appears to have ended in 1978 with the departure of their Canadian consultant. AID technical assistance stands a good chance of being carried out in a vacuum not only within the government of Honduras but among the critically important lenders.

The problem of energy use in transport is almost certainly the most complex problem in energy policy.* This complexity is inherent in the large number of actors, the tremendous variety of transport services, and the interaction between changes in energy use and changes in the quality or nature of the service. Transportation/energy policy is also politically very sensitive since it touches so many people's lives in so many ways. All these problems are exacerbated in Honduras by the comparatively poor data base. The evolution of effective policy capability is going to be a slow process that will require more time than any ST/EY technical assistance project could provide and it would be excessively optimistic at this point to assume that

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* This statement is based on the author's own experience in Brazil (ref. 25 and 26), conversations with IBRD staff, the IDB conference (ref. 22), the experience of producing an energy/transport proposal with staff of the MIT Transportation Center, and many conversations with people in the energy area.

Table 5-1

Approved Funding for Investment in Transport Sector
(Million lempiras)

	1982			1983			Additional Proposed Funding 1983			Total Possible 1983	Proposed Funding for Investment in Transport 1985		
	Internal Funds	External Funds	Total	Internal Funds	External Funds	Total	Internal Funds	External	Total	Total	Internal Funds	External Funds	Total
Subtotal Ministerio de Comunicaciones Obras Publico, y Transporte	36.6	82.8	119.4	39.6	146.2	185.8	3.7	13.4	17.1	202.9	37.67	187.6	225.2
Direccion General de Caminos (Bureau of Roads)	28.8	79.4	108.2	29.4	134.4	163.7	3.7	13.3	17.0	180.7	33.2	169.9	203.1
- Studies and design	0.9	0.2	1.1	0.9	0.2	1.1	-	0.1	0.1	2.9			
- Construction, improvements, and supervision	27.9	79.2	107	28.5	134.2	167.5	-	-	-	18.9			
Direccion General de Obras (Public Works)	7.3	1.4	8.7	2.1	0.7	2.8	-	-	-	0.4	0.2	0.5	0.7
Civiles e Aeropuertos (Airport Authority)													
Direccion General de Mantenamiento (Maintenance Dept.)	0.3	0.9	2.2	7.8	11.0	18.9	2.2	8.7	10.9	44.6	3.5	13.7	17.2
Direccion General de Urbanism (urban planning)	0.2	0.1	0.3	0.4	-	0.4	0.4	1.9	2.3	2.5	6.2	25.6	31.8
Subtotal Empresa Nacional de Puertos (Port Authority)	2.8	5.1	7.9	2.2	31.5	33.7	6.3	24.0	30.3	250.0	47.3	226.9	274.2
Subtotal Ferrocarril Nacional de Honduras	0.2	-	0.2	0.2	-	0.2							
Total	39.6	87.9	127.5	42.0	177.7	219.7							

Source: Reference 20.

Notes: 1. Due to organizational changes, some categories in 1982-83 cannot be continued to 1985.

2. 1985 figure includes 10 million lempira already approved for the Bureau of Roads from external sources.

USAID/Honduras would follow through in an area so far outside its traditional areas of emphasis.

A couple of specific areas with energy implications in which project-oriented technical assistance could be useful are freight terminals for intermodal integration and urban mass transit in Tegucigalpa. The GOH has, on its own, been carrying out modest planning exercises and could use some assistance. Of these areas, freight terminal planning would probably have the highest priority. Initial assistance could be provided for a planned terminal near San Pedro Sula (the principal industrial city, near the north coast). The concept behind this terminal is that products coming from Puerto Cortez would be shipped by rail to the terminal and transferred to larger trucks to continue to Tegucigalpa. This would take pressure off the overloaded Puerto Cortes/San Pedro Sula highway which otherwise must be expanded soon. The terminal would also integrate truck freight with the rest of the north coast railway freight and make use of larger, more efficient trucks for line haul movements and smaller trucks for shorter range movements that serve the coast. Assistance could also be given to evaluate the problems encountered by the one terminal already established and to assist in planning others (e.g., in Tegucigalpa). The idea of terminals (at least as planned) has been meeting considerable resistance from truckers, which suggests that any technical assistance should emphasize sensitivity to local issues to avoid technically sound but politically useless recommendations.

The urban mass transit assistance would start with the proposal to construct an electrified trolley line for Tegucigulpa. In order to be effective, it should look at the alternative of rationalizing bus fleet

operation along with some transport-related urban planning efforts. The urban railway will probably not be built because of lack of money, however, the issue of bus system rationalization is politically sensitive and extremely complex due in part to the proliferation of tiny bus companies. The international comparative advantage for work in this area is almost certainly not with American consulting companies, but rather (in this hemisphere) with Brazilian companies which work in conditions quite a bit closer to those in Honduras. Also, several cities in Brazil have dramatically improved the overall efficiency of privately owned bus operation over the past few years.

These two distinct project possibilities, freight terminal planning and urban mass transit planning, do have appeal. They do not address broad policy problems, but they attempt to deal pragmatically with important project issues. The problems with these projects are:

(a) Neither may be reconcilable with the industrial/residential programs proposed in terms of ST/EY budget capability. The industrial/residential programs have higher priority because they are more likely to influence future AID activity and more likely to evolve towards an overall sectoral policy. (see also points c and d)

(b) Even if reconcilable in budget terms, they would have virtually nothing to do with most of the rest of the proposed work. Some coherence within an overall project is preferable to a rag bag of unconnected projects.

(c) In and of themselves neither does much to advance overall thinking in transport/energy policy. Given the institutional context they are likely to be treated as isolated projects.

(d) AID is very unlikely to be the financing agency for the recommended actions. Whatever agency that might be would probably want to do much of the work all over again to satisfy its own criteria.

Faced with the dilemma of the obvious importance of the subject, the need for work, and yet the nagging problems of a more operational nature, it may be

useful to formulate a different line of attack. We briefly summarize some thoughts for a new proposal.

Project Outline

The basic project concept is to have a carefully prepared regional workshop directed at a limited number of countries with broadly similar problems.

(a) The workshop would focus on small, oil importing countries in the Caribbean Basin. This would get rid of much of the vagueness which inevitably attended the 1980 IDB conference in which enormously different countries were active participants.

(b) The workshop would focus on energy demand, avoiding as much as possible fuel substitution (with the exception of some electrification).

(c) The workshop would concentrate on relatively systematic and practical guidelines for policy action; pooling world-wide theoretical analysis and practical experience and relating these to the specific transport structures and experience in the region. One possible conceptual framework for this is partially illustrated in Tables 5-2 and 5-3. The former illustrates the "physical" structural changes which tend to reduce consumption, the latter the policy tools available to achieve such changes. In between one must evaluate effectiveness and costs and benefits.

(d) The workshop would be preceded by work in each of the participant countries based on the conceptual framework, though the emphasis could vary from country to country. For example, different case studies of specific issues could be developed in some depth in different countries depending on local priorities and information (e.g., interurban freight and passenger terminals in Honduras, urban transit in Santo Domingo, derivative pricing policy in Costa Rica, etc.). Specific tested ideas from other regions might be explored in such case studies.

(e) Part of the time of the workshop should be divided into parallel working groups permitting intense detailed discussion of specific issues.

Table 5-2. Changes in Transport System Characteristics to Reduce Petroleum Product Consumption

	Effecting Transport Intensity per Unit of GDP	Effecting Energy Consumption or Fuel Substitution Per Unit of Transport Services
Vehicle		More efficient new vehicle (e.g., diesel vs. gasoline) Retrofit (wind deflectors, turbochargers, radial tires) More efficient vehicle sizing (generally smaller for cars and larger for intercity trucks) Alcohol fueled vehicles Electric vehicles
Infrastructure/ Nodes	Terminal location to reduce routing distance	Multimodel integration (e.g., piggyback) Consolidation of loads for larger more efficient vehicles in the same mode (e.g., small trucks for distribution, heavy trucks for intercity)
Infrastructure/ Links	More direct routes	More energy efficient roadways (fewer grades, improved surfaces) Improved capacity and speed of rail and waterways Improved conditions of traffic (bus lanes in urban areas) Electrification of railways
Operation/Nodes		Improved service linking modes/facilitation of multimodel operations Freight consolidation terminals

Table 5-2. Changes in Transport System Characteristics to Reduce Petroleum Product Consumption (continued)

	Effecting Transport Intensity per Unit of GDP	Effecting Energy Consumption or Fuel Substitution Per Unit of Transport Services
Operation/Links		Improved maintenance of vehicles (especially engine and tires in road vehicles) Change in operating behavior (speed) Improved routing to reduce empty backhaul Improved operation of rail and waterways to increase quality of service
Demand	Structure of the economy (both final and intermediate consumption) Location of traffic sources (industrial/residential development) Size of automobile fleet	Modal preference (e.g., intensity of use of automobiles)

Table 5-3. Categories of Policy Actions

I. Information and/or training programs, such as:

training of operating personnel in preventive maintenance
freight information centers

(These tend to be low-cost and politically/administratively easy but must be giving something new to have impact)

II. Subsidies and financial incentives, such as:

special lines of credit
reduced mass transit fares
direct government investment in road, rail, port, mass transit infrastructure

(These tend to be politically/administratively easy, but may be expensive for government)

III. Taxes and financial disincentives, such as:

fuel taxes
vehicle taxes
parking fees
credit restrictions for certain kinds of equipment
duties
tolls

(These tend to be cheap for the government and economically efficient but politically difficult)

IV. Regulation and direct control, such as:

close gas stations on week-ends
management and operating policies of systems where the government has direct control, such as rail operations
traffic and parking control
speed limits
subsidized pricing for that part of fuel effecting significantly cost of living of the poor (e.g., low electricity tariffs for first 100-150 kWh)
industrial location policy
urban planning
import restrictions
prohibition of trucks where rail available.

(These tend to be administratively difficult and often economically inefficient and unpopular, but can be effective if not too expensive for the government.)

(f) From each participant country there should be more than one senior level technical person from the government as well as private sector representatives. At the end there should be senior political level representatives (ministerial or vice-ministerial level). In addition, there should be USAID, AID Washington, IDB, IBRD, CDB, CBEI, and perhaps UNDP and OAS personnel with varying levels of activity. One objective is to help clarify other donor institutions' thinking, since they, rather than AID, are likely to do 90 percent of the actual financing. Finally, there will be the consultant's personnel (it is assumed that the project would be organized by a consulting firm). It is evident from this list that the number of participating countries should be limited (probably no more than six or so) to keep the workshop from becoming unwieldy. Complete coverage of the region is not necessary in any case. It is possible that for the final plenary sessions more countries could be invited to get some first hand contact with the outcome.

A workshop of this type, far more focused than the 1980 IDB Latin American conference,[22/] would provide a useful bridge between the more conceptual, almost global-oriented analysis now going on in places like the IBRD or the ST/EY Energy Policy Research Program and the specific problems within the region which are now either not being considered at all, or being dealt with in a desperately ad hoc manner. A project of this nature could help clarify the complex issues of strategy and implementation which have virtually paralyzed donor and country activity in the area. It could also circumvent the spotty data and experiential base typical of each individual country. By being regional in scope resources can be expended for necessary policy orientation that would be difficult to justify for any one of these small countries.

This project would achieve a certain level of visibility at the political level, a sine qua non for mobilizing the kind of resources necessary to start dealing intelligently with the region's biggest and most difficult energy problem.

Chapter 6

Additional Aspects of Overall Project Implementation

The following policy analysis projects have been proposed for Honduras:

Project 1: Industrial fuel substitution and switching;

Project 2: Support for development of an industrial conservation consulting capability;

Project 3: Urban cooking/fuelwood/deforestation project;

Project 4: Price policy, including the consequences for Projects 1 and 3; and

Project 5: Regional transport/energy demand workshop

These projects, especially Projects 1 through 4, relate to each other in various ways. Projects 1, 3 and 4, overlap in content while Projects 1 and 2 could overlap and reinforce each other strongly. It should be possible to organize these (or several of them) into a single project. The central counterpart should be CONSUPLANE, but specific components would usually also involve closer counterpart relationships with other institutions (e.g., COHDEFOR, ENEE).

Sources of Funds

Because of potential overlaps with other projects, the varying levels of counterpart contributions and some variation in AID funding sources, it is difficult at this point to get very precise about budgets. It is expected that ST/EY would finance Project 1, but the amount needed could be influenced by whether the mission funds Project 2 (ST/EY should not consider funding this). Also ST/EY might finance a part of Project 3. The mission could use their funds for project development since there seems to be considerable mission interest in Project 3 and because the proposed work is oriented

towards developing and evaluating possible projects as well as policies. Project 4 is envisioned as being funded by ST/EY, but some local work might be paid for by mission local currency funds or other (non-AID) sources altogether.

Depending on a variety of factors, Projects 1, 3, and 4 would represent some $225,000 - $300,000 over eighteen months for ST/EY. Possible mission or ROCAP expenditures might go as high as $70-80,000, excluding Project 2. If funds are inadequate, Projects 1 and 3 should remain intact and Project 4 (pricing) cut proportionately.

Projects 1 and 3 (industrial substitution and urban cooking) should be of considerable help to the mission in designing its own possible projects for FY 1986 (this was the earliest date for a new project, as we were briefed), though they would not be limited to that objective. In the interim the mission might contribute to certain parts of Projects 1, 3 and 4 with lempira funds, IQC money, or a small shift of funds from another project. Project 2 (developing a nationally based audit team) is the primary responsibility of the mission, though this task would be helped if Project 1 were executed by ST/EY. It is possible that mission funds will not be necessary, but also that local currency funds for mid FY 1984 may not be available. The issues raised in this proposal justify the serious attention of the mission, with perhaps some assistance for further evaluation from ST/EY.

Involvement of the Private Sector

Private sector organizations can be involved in the policy planning process of the projects; subsequently, they can also participate in the opportunities for productive investment which will be generated by these projects. Generally projects of this sort can encourage investment from the private sector by: (a) investing in relevant private sector skills (e.g., use

of a local counterpart consulting); (b) providing a serious forum for expression of points of view; (c) developing useful information and making it accessible. The use of a local consultant seems to be a particularly useful approach which has not been adequately developed. Special centers at universities should be included in this group, in part because they can and do lead to spin-off businesses. It has been implicit in the proposals presented (and in the preliminary budget) that there would be a local non-government consulting counterpart paid for by the project. The development of such private sector service capability is a fundamental step for increasing private sector participation. It also permits the government to do less policy work in-house without having to rely on expensive foreign consulting. Domestic consulting groups are also likely to diffuse the results of their efforts to a larger audience as a result of their marketing efforts than would government agencies. This in turn helps various groups within the private sector to articulate better their evolving needs, and increase their participation in the policy process beyond a predictable chorus for energy price subsidies.

Discussions with and participation by the private sector are also important. These can be more permanent (as in the ICAITI/ROCAP industrial energy conservation project) or periodic. The short term nature of the ST/EY work precludes a permanent forum, but detailed workshops including the private sector should be included. The regional transport policy workshop (Project 5) proposed earlier is an example. Projects 1 through 4 also assume working meetings with the private sector.

In terms of creating investment opportunities, Projects 1 and 2 are likely to be quite fruitful. Project 1, industrial fuel substitution, is, in effect, a comparative market analysis for a range of investment possibilities in industry (many rather small scale) that should be attractive to the private

sector. The industrial energy conservation work touched on in Project 2 simply expands the range further. The idea behind Project 2 is to insure that the ICAITI/ROCAP project has as useful an impact on industrial energy conservation as possible, which implies considerable private investment.

Chapter 7

Project Applicability to Country Selection Criteria

The terms of reference for this reconnaissance study require that the set of projects proposed above for ST/EY assistance to Honduras be reviewed in light of the country selection criteria in Table 7-1. The numbers for the following paragraphs refer to these criteria.

Paragraph 1

There is clearly an interest in key parts of the GOH for the assistance projects proposed here. There are several specific proposals before the Government of Honduras that parallel the work proposed here.* The mission also appears to be interested, though this judgment is complicated by the staff transition underway at the mission and some LAC resistance to the idea. The existence of the ST/EY project would help the mission develop a project for FY 1986.

In FY 1985, ROCAP's, Proyecto Lena will end. Projects 1 and 3** will help to determine whether and how the fuelwood development should be continued, drawing on other experiences in Honduras and the region. Fuelwood is being taken more seriously now in the government and AID has a tradition of involvement in various aspects of fuelwood development (Proyecto Lena, Rural Technologies Project). The proposals are intended to go beyond project development for the mission, being instead responses to specific areas of planning interest to the Government of Honduras where technical assistance could be useful and where there is an interested counterpart. This targeting of specific areas, with more emphasis on specific technical assistance than on

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* The complementary nature of these ongoing and proposed activities is illustrated in Figure 5-1 for Project 1.

** Following the listing which opens Chapter 6.

Table 7-1. Office of Energy

Country Selection Criteria

1. A significant demonstration of interest in technical assistance for energy policy development and conservation on the part of the host government and the country AID Mission, including an indication that the country AID Mission will fund related or follow-up activities;

2. The critical nature of the national energy problem as it relates to overall economic performance, development prospects and to the national security and political stability of the country;

3. The current existence of, or active plans to create, a government entity responsible for energy planning, policy development and conservation, and with which project personnel can work productively;

4. A potentially productive, non-duplicative, complementary relationship between the proposed activity and other A.I.D. projects (both bilateral and centrally-funded) within the country, as well as projects of other donors;

5. The identification of appropriate and useful project activities which are likely to promote the development of country policies that will in turn aid in resolution of the country's energy problems;

6. The potential replicability or applicability of project activities and results in other A.I.D.-assisted countries;

7. The potential for the proposed policy development or conservation activity to provide leverage for significant and productive energy sector investments, especially in the indigenous private sector and from U.S. private sources, but also from other official lenders such as the multilateral development banks;

8. The overall strategic or political importance of the country to U.S. foreign policy, and strong friendly ties between the U.S and the country.

generalist assistance* was universally supported within USAID/Honduras and the Government of Honduras. By responding to this preference, active interest will be enhanced. Finally the existence of this project may have a favorable indirect impact on the evolution of the regional industrial energy conservation project in Honduras.

Paragraph 2

Honduras' energy problem is no more severe than many countries', but it is clearly having a negative impact on the economy, as described early in the paper. By 1982 fuels amounted to 24 percent of total imports. Furthermore there appear to be opportunities, requiring increased planning capability, to ameliorate the energy problem (or problems, including fuelwood) in a cost effective way. Energy is widely recognized in the country as being of critical importance to the nation's development (e.g., reference 4).

Paragraph 3

There is no central planning entity for energy, especially considering the various levels of planning (e.g. projects, macroeconomics, policy, etc.) nor is one likely to emerge soon. However, this need not impede the productivity of project personnel nor limit their counterpart contact. CONSUPLANE could serve as overall coordinator. It appears to be best fitted for this role, adding institutional coherence to the existing synergism in the content of the proposed projects. Much of the work could be done in direct collaboration with other agencies of the government. Strengthening various parts of the decentralized planning process appears by consensus to be a valid strategy and the preferred one for Honduras at least for the time being.

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* In contrast to the recommendation for Haiti in a study similar to this.

Paragraph 4

The relationship of the various proposals to other existing and proposed donor projects has been rather extensively discussed in the text. That useful space exists for something like these projects seems clear, though some flexibility should be built into project design because there are other actors whose plans will unfold over the next six months. The existence of other actors should be taken as a positive sign indicating a chance of greater resources to follow through on the conclusions of the planning work. Working with CONSUPLANE as coordinator should help assure that unnecessary duplication is avoided since one of CONSUPLANE's roles is the monitoring of foreign financial projects in each sector. Joining with the OLADE/IDB Prodeca project, AID could usefully strengthen CONSUPLANE's capability to coordinate foreign assistance in close contact with various Government of Honduras agencies and the private sector.

Paragraph 5

A set of proposed project activities has been presented in some detail and justified in the text. They all address important areas of concern (e g. industrial fuel substitution, urban-caused deforestation, industrial conservation); they can be carried out with a problem-oriented emphasis and within key (but now usually weak) planning groups. This could provide a stimulus to the development of cost-effective adjustments that have not yet been made (or even identified).

Paragraph 6

The basic issues raised in Projects 1 through 5 are of importance in most of the larger oil-importing Caribbean and Central American countries.

Experience in these countries may also be of interest to Honduras. There is a good possibility of increased flow of important information in two ways. Projects of the kind proposed here would be a valuable addition to understanding in the region as a whole and to our knowledge nothing like it is being planned elsewhere. It could have some important repercussions in other countries even if not formally replicated by AID.

Paragraph 7

This and other private sector impacts were already discussed in the previous chapter. The impact on private sector investment (if the private sector is investing at all) could be quite significant, especially if the impacts of complementary, policy-oriented projects are considered. Possible activities attractive to the multilateral banks (e.g., low cost credit line for some industrial conservation investments as done in Brazil) could emerge directly from the projects proposed here.

Paragraph 8

Honduras is clearly a country of strategic importance in United States foreign policy today and American ties are very strong. The scale of assistance has been growing and bilateral US aid is a relatively important source of official development assistance. AID may be encouraged to take a lead role in more areas of technical assistance such as energy, where there is a general consensus (Honduran and non-Honduran) that AID could do more than any other institutional donor to strengthen the country's planning and project capability.

Summary Recommendation

Although the final decision must remain with ST/EY and the mission, it is recommended that:

(a) ST/EY fund projects along the lines of Projects 1, 3, and 4 over an 18 month period using CONSUPLANE as a coordinating Government of Honduras counterpart.

(b) means be sought for some mission contribution (such as the local currency account) to some project components. This may be necessary if Projects 1, 3, 4 are to be funded adequately (if funds are inadequate, Project 4 should probably be cut most, first).

(c) the mission and ST/EY seriously review the ICAITI/ROCAP Industrial Conservation project in the light of criticism made here and in various countries; and that they consider supporting modifications to the project together with other countries in the region, which would increase its efficacy.

(d) ST/EY consider planning assistance in transport/energy policy around a regional workshop as described (Project 5), using Honduras and other countries for fairly specific case study work.

There is clearly scope for useful work, Honduras' importance is not in doubt, and AID's role in Honduras is substantial.

In executing the project, it might be best to have a single consulting firm organize the technical assistance (perhaps in part through sub-contract). This should improve coherence of the overall project, though other possibilities should be considered. There should definitely be a strong local non-government presence on either the consulting team or in the overall effort. Development of capability in both the public and private sectors in Honduras should be a clear goal as the proposals are developed.

Annex A

Petroleum Product Pricing

The pricing of petroleum in Honduras is totally government regulated. Prices are fixed by product at all levels of its commercialization. Seven products are priced: premium gasoline, regular gasoline, kerosene, jet fuel, diesel, fuel oil (bunker C) and LPG. The levels of commercialization controlled are: refinery gate (same for imported finished products), wholesale level and retail level. The wholesale and retail prices are set for 7 different geographic zones which are based on distance from the refinery. These prices are set by fixing: (1) refinery price, (2) consumption taxes, (3) shipping costs, (4) distributor's margin, and (5) retailer's margin. In setting the prices, the government deals with the following private sector entities: (a) Texaco, (b) la Asociacion Hondurena de Distribuidores de Productors Derivados del Petroleo (AHDIPPE), and (c) the transporters.

The regulation of petroleum prices was initiated and authorized through "Ley No 91" of 8 November 1973. The process is that changes are initiated by request from any of the private sector entities listed above (usually Texaco), then negotiated (as described below) between the government and the private sector as well as internally within the government. At the conclusion of the negotiations, an "acuerdo" is issued by the Secretaria de Economia on behalf of the President, before 1982 on behalf of la "Comision del Decreto Ley No. 91 del 8 Nov. 1973". In all, there have been about 15 "acuerdos" issued.

The negotiations involved in the pricing decisions are:

- the Texaco refinery gross income and profitability levels,
- the distributor and retailer margins,
- the transport costs for each zone,
- the price levels for each petroleum product.

The first three involve primarily government-private sector discussions whereas the fourth is primarily an internal government issue. The government institutions which play a role in these negotiations and the approval of the prices are as follows:

1. Oficina Comercializadora de Petroleo*
   - Ministerio de Economia
   - Banco Central de Honduras
   - Ministerio de Hacienda

which is located in the Ministerio de Economica and supported by a staff headed by Adalberto Chavez Petit who is assisted by one other professional as well as by transport ministry personnel.

2. Cabinete Economica
   - Ministerio de Economia
   - Banco Central de Honduras
   - Ministerio de Hacienda
   - CONSUPLANE
   - Ministerio de Comunicaciones, Obras Publicas y Transporte
   - the President

3. La Comision del Decreto Ley No. 91
   - representatives of the government, workers, and private business.

The negotiation most important in terms of its impact on the petroleum price is that with the Texaco refinery. In this work only the overall refinery income and profitability is worked out. The individual product prices are essentially left to the government, so long as the total revenue stream meets the overall refinery income agreement. The refinery negotiations are generally handled by the Minister or Vice-minister of "Economia" sometimes with the assistance of the other members of the "Oficina Comercializadora de Petroleo." The majority of the initial technical and economic analysis

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* This office is in the process of being changed to the "Comision Administradora de Petroleo" with basically the same members and staff but with a slightly enlarged scope but still limited to petroleum commercialization issues.

appears to be performed by the staff of the "Oficina". As negotiations proceed and a proposal is being formulated for submittal to the Cabinete Economica, working level meetings are held with various technical persons from the members of this Cabinete. The package submitted to the Cabinete Economica consists of the overall refinery income level and the individual petroleum product prices. The main function of the cabinete meetings is the setting of the product prices in terms of which products should bear what share of the total refinery cost increase. The "policies", which were never made explicit but are fairly clear and standard, that underlie these product price decisions are:

- keeping kerosene prices relatively low* for the benefit of the residential sector,
- keeping diesel prices relatively low* for the benefit of the transport sector
- subsidizing fuel oil prices in order to stimulate demand and alleviate the refinery output balance problems,
- setting high regular and premium gasoline prices as a means of paying for the lower prices of other products as well as a source of government revenue.

These "policies" of the economic cabinet incorporate the concerns of the Comision de Decreto Ley No. 91. It is in this informal way that the presence of this Comision is felt even though the final approval of petroleum prices by the Comision is more or less a "rubber stamp".

Price negotiations concerning transport costs and sales margins coincide with the refinery agreements. These costs have been gradually increased but form a small part of the total prices.

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* Relatively low but still at about international prices; however they are low because it appears that they may not be carrying their share of the high refinery costs.

The consumption tax structure for petroleum prices has not changed since its initiation in the early 1970's. The taxes have been constant and are approximately:

	centavos per liter
premium gasoline	40
regular gasoline	39
kerosene	1
jet fuel	1
diesel	7
fuel oil	1

Since these taxes have been constant, government revenues have been falling significantly in real terms. This is symptomatic of the lack of interest in changing or increasing fiscal revenues from this source.

Annex B

The Electrical Sector of Honduras

The electrical sector primarily consists of the public agency "La Empresa Nacional de Energia Electrica" (ENEE). Minor roles are played by the energy department of CONSUPLANE and various remote municipal governments. CONSUPLANE is formally in charge of electrical sector policy as part of its work on the national development plan and the constituent sector plans. Because of CONSUPLANE's lack of executive power as well as other factors, this group has not played a significant role in policy making except through its seat on the Board of Directors of ENEE. Various municipal governments own and operate isolated electricity generating facilities, however, the total capacity of these stations is only 5 to 10MW or only a few percent of total generating capacity in Honduras.

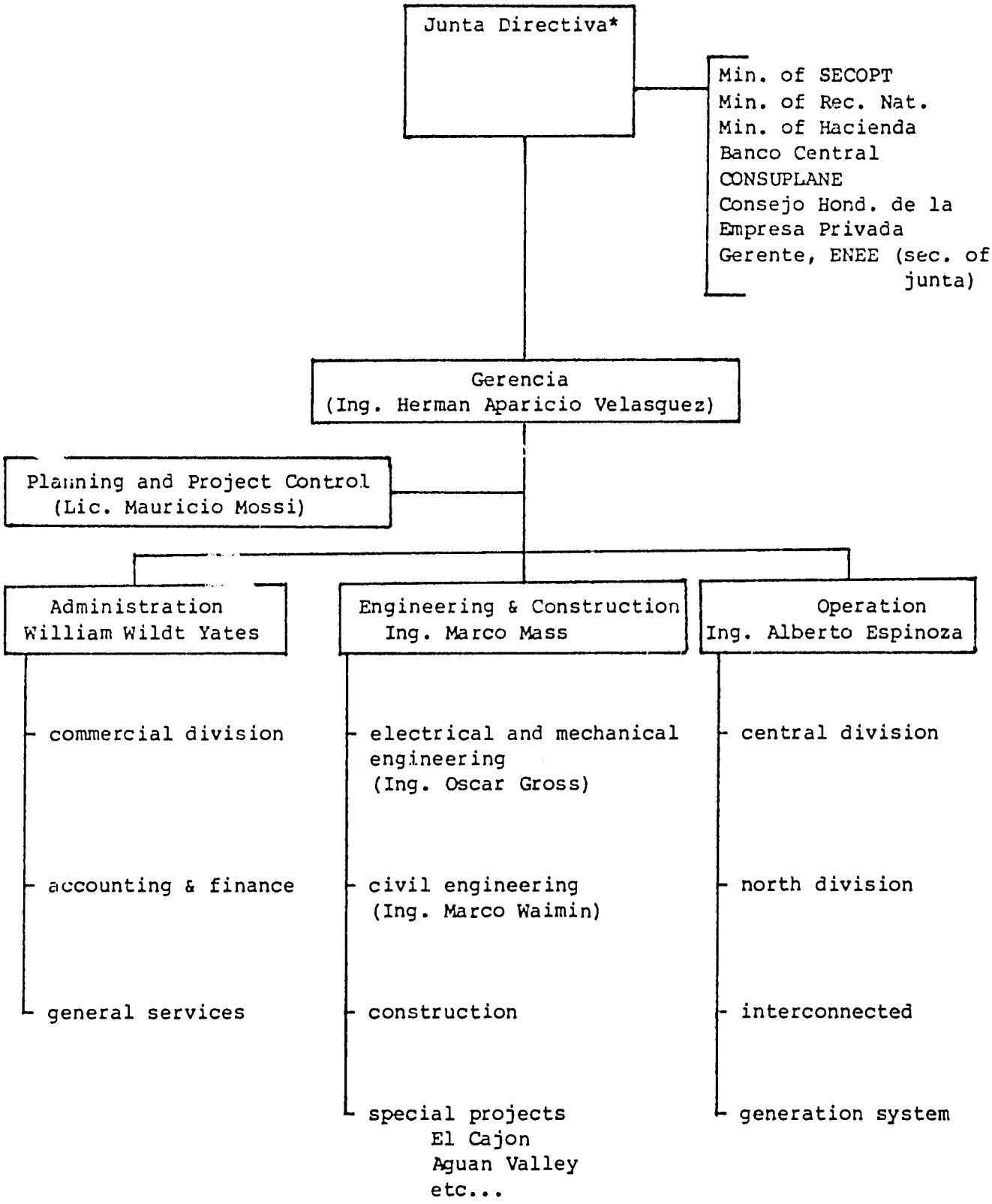
Empresa Nacional de Energia Electrica (ENEE)

ENEE was created as an autonomous agency of the Government of Honduras via "Decreto Ley No. 48" in February of 1957. Essentially ENEE is in charge of all aspects of the electrical sector; the influence of other groups is affected through the six outside members of the Board of Directors:

1. Ministry of Communications, Public Works and Transport
2. Ministry of Natural Resource
3. Ministry of Finance
4. Central Bank of Honduras
5. National Planning Council - CONSUPLANE
6. National Business Council - Consejo Hondureno de la Empresa Privada

The only other member is the general manager of ENEE who is the secretary of the board. A simplified organizational chart is shown in Figure B-1.

Figure B-1. ENEE Simplified Organization Chart



* Junta meets about two times per month

The remainder of this annex will address the following aspects of the electrical sector and ENEE: policy, pricing, investment, and special projects.

With regard to policy, its formulation appears to lie nearly totally within ENEE given the lack of forceful input from CONSUPLANE. Furthermore, the perspective of ENEE is basically one of a private electric utility, hence the scope of issues considered within the interest of ENEE is limited. As a result there are no clear policies with regard to rural electrification, private electric generation, non-conventional generating technologies and conservation. Current pricing policy is based on a cost basis with relatively little subsidy of one class of consumers by other classes. Furthermore there is no particular policy with regard to purchases of power from private producers. This consideration is important for such possible projects as cogeneration and generation by industries with biomass residues. Brief conversations with ENEE did not indicate any initial resistance to ENEE power purchases. The most difficult aspect of this issue would be the price negotiation and the particular issue of basing the price on marginal or average ENEE production. Again the very brief conversations with ENEE indicated willingness to use a marginal cost basis which could greatly improve the profitability of such private sales to ENEE.

The setting of electricity tariffs involves the following process. Pricing studies are performed by international consulting firms approximately every four years under the direction of the planning department. These studies set the overall pricing structure and level. The effects of these studies is clearly evident in the historical time series price data where the major tariff increases and structural changes occurred in years of the studies (see Table B-1). A small group (about three persons) within the planning department is responsible for proposing tariff changes. These changes

Table B-1. Electricity Tariffs by Class 1972-1982
in Real Terms (1972=100)

	Residential	Commercial	Industrial	Large Industrial	Government and Municipal	Total Sales
1972 real	100	100	100	100	100	100
1973	94	94	96	96	95	94
1974	85	86	86	91	88	85
1975 International Tariff Study	90	88	101	128	95	95
1976	84	82	90	124	81	91
1977	83	77	86	131	90	92
1978	79	76	68	-	87	91
1979	73	79	90	135	86	89
1980	76	83	85	156	92	92
1981	61	77	75	150	85	85
1982	57	73	85	145	89	84

generally are of a fine-tuning nature in that they are of a smaller magnitude and are based on the monthly financial position of ENEE. The approval and authorization of the tariffs proposed by the planning department are performed by the Junta Directiva of ENEE, and currently, the final approval comes from the President.

Another more recent factor in electricity pricing is the requirement of international capital donor agencies as to the financial condition of ENEE. The in-house capacity for performing economic, planning and pricing studies does not appear to be significant nor, unfortunately, is there any great movement in this direction.

The tariff structure has six classes of consumers:

Tariff A - residential
Tariff B - commercial
Tariff C - industry
Tariff D - large industry
Tariff E - irrigation (not in use)
Tariff F - public sector

Tariffs A and B each have several steps with decreasing unit prices at high consumption levels. The residential schedule has a very small and limited "lifeline" effect of a slightly lower rate for the first 20 kwh. Tariffs C and D are both flat rates with a peak power demand charge. This power charge appears to be quite high and would constitute about 45 percent of total charges with a 25 percent monthly load factor for schedule C.* Tariff E was developed for the banana companies in order to capture the market for pumping, however, the companies use Tariffs C or D which are both lower than E.

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* It is not known to what extent ENEE has played with this charge to stimulate load management or if this share of total cost is high--it appears high.

No information was available on the public sector tariff structure. The current tariffs are shown in Table B-2. The consumption of electricity by tariff is shown in Table B-3.

The raising of investment funds for ENEE projects is generally performed within ENEE, however, the particularly high cost of the El Cajon project has led to some government involvement. The sources for ENEE funds are primarily international agencies while a much smaller portion of the funds (probably only about a third) is raised by ENEE from commercial banks or is generated internally. With the exception of El Cajon, ENEE performs its own negotiations and loan arrangements rather than working through the Ministry of Finance. Such work is performed within the administration department of ENEE.

There are a number of special projects within ENEE which are of interest:

1. rural electrification in Aguan Valley with AID;
2. time of day metering;
3. small-scale hydro project development; and
4. dendrothermal power generation project.

The AID financed rural electrification project needs little explanation except to say that it is the only rural electrification project being undertaken by ENEE and this project is the result of the strong desire by AID to perform such work rather than any particular interest by ENEE in this area. This project has an office with the Special Projects division of the Engineering and Construction department.

The second project consists of the installation and monitoring of about 150 time-of-day meters in primarily large and industrial settings and is being managed by the commercial division within the administration department. The goal of this project is to decide the efficacy of installing this type of

Table B-2. (Continued)

Abril	Mayo	Junio	Julio	Agost.	Sept.	Oct.	Nov.	Dic.
2.7561	2.7871	2.8185	2.8502	2.8823	2.9147	2.9475	2.9807	3.0142
0.1826	0.1847	0.1868	0.1889	0.1910	0.1931	0.1953	0.1975	0.1997
0.1335	0.1350	0.1365	0.1380	0.1396	0.1412	0.1428	0.1444	0.1460
2.7561	2.7871	2.8185	2.8502	2.8823	2.9147	2.9475	2.9807	3.0142
5.0123	5.0832	5.1551	5.2280	5.3019	5.3768	5.4528	5.5299	5.6081
0.2170	0.2201	0.2232	0.2264	0.2296	0.2328	0.2361	0.2394	0.2428
0.1823	0.1849	0.1875	0.1902	0.1929	0.1956	0.1984	0.2012	0.2040
0.1253	0.1271	0.1289	0.1307	0.1325	0.1344	0.1363	0.1382	0.1402
5.0123	5.0832	5.1551	5.2280	5.3019	5.3768	5.4528	5.5299	5.6081
21.6720	21.9783	22.2890	22.6041	22.9236	23.2476	23.5762	23.9095	24.2475
13.4004	13.5823	13.7667	13.9536	14.1430	14.3350	14.5296	14.7269	14.9268
0.0892	0.0904	0.0916	0.0928	0.0941	0.0954	0.0967	0.0980	0.993
13.2397	13.4387	13.6407	13.8457	14.0538	14.2650	14.4794	14.6970	14.9179
0.0815	0.0827	0.0839	0.0852	0.0865	0.0878	0.0891	0.0904	0.0918
14.2648	14.4792	14.6968	14.9177	15.1419	15.3695	15.6005	15.8350	16.0730
0.0917	0.0931	0.0945	0.0959	0.0973	0.0988	0.1003	0.1018	0.1033

Table B-3. Ventas Consumidores E Ingresos

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Sales (000's LPS)											
Residencial	8,285	9,431	11,865.7	14,304.9	15,575.7	18,600.8	22,117.8	26,072	32,355	38,353	43,382.9
Comercial	4,562	4,881	4,548.4	6,978.8	7,486.9	8,966.3	10,522.6	13,560	17,706	19,799	21,770.6
Industrial	2,909	3,416	3,845.0	4,652.4	5,880.2	7,655.1	23,926.9	12,561	16,664	20,407	23,448.4
Altos Consumos	4,090	5,124	6,321.7	11,972.1	11,916.2	14,926.9	--	19,347	26,099	28,019	30,738.6
Gubernamental y Municipal	1,081	961	1,159.9	1,406.1	1,525.0	1,934.8	2,245.2	2,979	4,176	5,009	48,831.0
Alumbrado Publico	205	217	269.3	277.8	415.4	797.0	940.2	988	1,194	1,474	1,593.6
Ventas a Otros Sistemas	8	8	9.4	9.3	953.6	2,110.1	164.9	120	115	364	515.0
Total	21,140	24,041	28,419.4	39,101.4	43,753.0	54,991.0	59,932.5	74,627	98,309	113,425	126,280.1
Annual increase (percent)	12.2	13.7	18.2	37.3	11.9	25.7	8.9	26.2	30.0	15.4	11.3
Income per kwhr (cents)											
Sector de Consumo:											
Residencial	12.3	12.2	11.9	13.8	13.8	14.5	14.9	14.7	15.3	16.0	16.4
Comercial	9.8	9.6	9.5	10.8	10.7	10.7	11.4	12.7	15.1	16.1	16.6
Industrial	7.8	7.8	7.6	9.8	9.4	9.6	8.1	11.5	12.3	12.4	15.3
Altos Consumos	3.7	3.7	3.3	5.9	6.1	6.9	-	8.2	10.7	11.8	12.4
Gubernamental y Municipal	7.7	7.6	7.7	9.1	8.3	9.9	10.3	10.8	13.1	13.9	15.8
Alumbrado Publico	3.5	3.7	2.4	2.4	3.3	5.5	5.6	5.5	6.2	6.5	8.3
Ventas a Otros Sistemas	4.2	4.1	4.7	4.0	12.9	17.4	14.3	0.8	1.0	2.1	5.8
Overall average	7.5	7.4	7.2	8.9	9.1	9.8	10.4	10.9	12.8	13.5	14.7
Level of Consumption (000's kwhr)											
Residencial	67,451	77,310	94,254	103,182	113,076	128,691	147,581.3	177,616	211,350	239,659	263,887
Comercial	46,638	50,852	58,174	64,366	69,729	83,522	92,798.6	107,103	117,112	123,312	131,192
Industrial	37,137	43,775	50,676	47,391	62,841	79,700	296,512.5	109,311	135,451	164,295	153,222
Altos Consumos	109,684	136,901	165,533	193,492	194,296	215,582	-	236,284	243,410	237,642	247,958
Gubernamental y Municipal	14,109	12,576	15,078	15,435	18,268	19,516	21,706.8	27,472	31,871	36,402	30,514
Alumbrado Publico	5,840	5,828	11,019	11,483	12,449	14,366	16,881.5	17,911	19,400	21,374	19,221
Ventas a Otros Sistemas	189	193	199	233	7,374	12,115	1,155.7	15,084	9,167	17,696	8,829
Consumo entre Departamentos	685	630	715	720	715	720	725.0	730	735	740	745
Total	281,733	328,065	395,658	436,306	478,748	561,691	577,361.4	691,511	768,496	841,120	855,538
Annual increase (percent)	12.3	16.4	20.6	10.8	9.7	17.3	2.8	19.8	11.1	9.5	1.7

Table B-3. Ventas Consumidores E Ingresos
(Continued)

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Number of Consumers											
Sector de Consumo:											
Residencial	55,389	62,296	71,606	76,281	82,464	90,017	103,414	107,937	122,024	137,988	149,941
Comercial	7,657	7,944	8,912	9,215	9,601	10,086	11,110	11,224	12,001	12,749	13,089
Industrial	1,073	1,224	1,257	1,297	1,439	1,644	2,013	2,003	2,195	2,357	2,453
Altos Consumos	33	38	48	51	46	46	–	57	49	45	42
Gubernamental y Municipal	501	960	1,036	1,094	1,202	1,262	1,408	1,483	1,520	1,680	1,795
Alumbrado Publico	28	36	41	41	63	75	130	91	98	117	121
Ventas a Otros Sistemas	1	1	1	1	2	2	1	1	2	1	1
Total	65,082	72,499	82,900	87,980	94,817	103,132	118,076	122,797	137,889	154,937	167,441
Annual Increase (percent)	9.4	11.4	14.3	6.1	7.8	8.8	14.5	4.0	12.3	12.4	8.1

meter. This study should be completed by the end of 1983. Now it appears that ENEE views these meters as costly and complicated.

The third project is the result of technical assistance from Taiwan to ENEE--"Mision Tecnica para Energia Electrica de la Republica de China", has been in existence since about 1977 and works through the division of civil engineering. This project produces detailed feasability studies (including engineering drawings) of mini-hydro installations. Supposedly quite a number have been produced, yet no action has been taken on any of them. The recent AID PID on small scale hydropower wanted to use these studies as the basis for project site selections. The IDB appears to be interested in following them up.

The fourth project is one which involved the preparation of a pre-feasability study in 1979 by C.T. Main, Inc. for the planning department of a 25 to 30 MW wood-burning, steam power plant. The fuel would be primarily lumber mill residues and to a limited extent forest slash. Although this study has not been reviewed in detail for this report, no further work on this concept has been undertaken. It seems that this report was part of the analysis of a plant for the Puerto Cortes area where a fuel oil plant has since been constructed.

Meetings held concerning electrical sector:

1. Richard Dudley, chief of engineering office, AID
2. Hugo Eluir, engineer, engineering office, AID
3. Lic. Mauricio Mossi, chief of planning department, ENEE
4. Ing. Jose Francisco Vargas, especialista sectorial, Interamerican Development Bank.

Annex C

Institutional Issues with Regard to Biomass Energy Programs in the Agricultural Sector

These issues concern those of technology development, demonstration and extension as well as those of credit availability. As noted, the agricultural part of a biomass energy program would involve mechanical equipment which has special implications for the institutional issues. These implications result from the fact that the people who do agricultural research and extension work in Honduras have very little, if any, experience with such equipment. Nevertheless, the director of agricultural research has indicated interest in these ideas. First, a description of the institutions will be presented and then the specific biomass-related issues will be discussed.

Agricultural work lies within the Ministerio de Recursaos Naturalas. The relevant departments are: agricultural research, agricultural extension, and planning. Planning falls in the "seccion de planificacion sectorial." Each of these departments has their headquarters in Tequcigalpa. Tying together these groups is the PNIA, Program Nacional de Investigacion Agropecuario, which reports to the planning department. This program coordinates agricultural research policy and work. This is needed because, in addition to the nationally directed programs, there are seven regional agricultural program offices who are also part of the PNIA board.

The organization of these groups is not well-defined, however, the director of agricultural research, Adam Bonilla, has recently developed a scheme which he has effected in several zones and is actively promoting in the rest. It can be summarized as follows:

PNIA

Agricultural research | Agricultural extension

Regional Agricultural Personnel

Program Development → Research, field testing, refining, economic evaluation → extension

The agricultural research group consists of eight research stations which are supposed to work closely with the regional workers. Probably the weakest link is the final transference of the successful investigation results from the regional to the extension personnel.

The national agricultural development bank, BANADESA, provides agricultural credit. For the agroindustrial sector there are two public sector options: BANADESA and FONDEI. The major priorities for BANADESA are basic grains (30 percent) and small farmers (25 percent). There are credit lines by crop. One of the means for developing credit lines is via successful agricultural research and extension which is then reported to the planning department of the Ministerio Recursos Naturales. Next, the planning group presents credit allocation recommendations to the Minister who then reports them to a high-level government group (possibly the Comission de Politica Agropecuaria).

The current orientation of research, extension, and credit is towards animal-based agriculture with little or no concern for mechanization. The two major programs in which agricultural research is now being undertaken are both oriented to animal drawn implements and other small-scale technologies. They are; 1) the AID rural technologies program and 2) a technical assistance program with the Swiss.* Nearly all of the agricultural research station work

is biological (seed varieties, etc.) or chemical (fertilizer, pesticides, etc.) and there is no work or experience on mechanization. The closest the research stations come to this type of work is a workshop that was set up at Comayagua for the AID PTR program for animal drawn farm implements, hydraulic rams and water wheels. The extension service also has little practical experience with mechanization. Furthermore, within the priorities for credit within BANADESA, mechanization or motorized equipment have low priority. This low priority is in response to a policy of not contributing to an increase in petroleum use. This latter issue indicates the need to develop and "market" any machinery with the biomass energy source.

Another institutional issue for a biomass program is the option to work through the agricultural research group as a means of R&D and extension. This option not only provides a working situation but also converges with the process for establishing a credit line in BANADESA for equipment. Despite the interest expressed by the agricultural research director, the lack of experience with and facilities for mechanized technologies must be confronted. This issue would probably not be a major problem and possibly could build on the increased capacities (as a result of the AID project) of the Comayagua research station in this area.

Another possible route for biomass demonstration is through the Natural Resource Management Program funded by AID. This program has its own separate office in the Ministerio de Recursos Naturales and reports directly to the Minister. This program involves extension work in the Choleteca Valley. The program is beginning to work with tree planting for firewood and has available credit on the order of 20 million dollars.

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* This project also includes work on post-harvest issues such as storage and perhaps processing.

Annex D

Comments on the IBRD Petroleum Pricing Study

Within the task of reducing or managing petroleum use over the long-term, price is clearly one of the most important tools. Detailed study of petroleum pricing--the basis for selecting particular price levels and the many impacts of such prices--would be very useful. Energy conservation, fuel switching or substitution can be stimulated via price signals. These substitution issues include not only substitution among different petroleum products but also among petroleum products, electricity and indigenous energy resources such as biomass. Furthermore, prices can incorporate various policy concerns via taxes or subsidies. Despite this important role, there has been little comprehensive or systematic study of the pricing decision. Relatively recently the World Bank has been initiating a number of these studies and an increasing number of such studies is expected.

In Honduras, petroleum prices are used for stimulating conservation (i.e., high gasoline prices) and substitution (i.e., low fuel oil prices) and for raising government revenue (i.e., consumption taxes). Despite such uses, there is very little policy basis for prices and tax levels. Furthermore there has not been evaluation of the effectiveness of these price signals, nor active use of them. For example, the consumption taxes have not been changed since they imposed over ten years ago. Because of the major importance of controlling petroleum use and the potency of using price as a tool for policy implementation, a comprehensive study of petroleum price effects is warranted.

The two efforts soon beginning in this direction are:

1. a World Bank funded study via the Oficina Comercializadora de Petroleo in the Ministry of Economia, and

2. an ICAITI/SIECA study not yet defined.

The overall thrust of a petroleum pricing study is to examine in detail the range of effects which can be caused by alternative pricing scenarios. The effects include energy sector policies such as: energy conservation and fuel substitution as well as the numerous broader and secondary economic impacts. These impacts are:

- macro: on government revenues, economic growth (via effects of consumption and investment)
- micro: on the different consumer income levels (especially the lower ones), particular industrial subsectors (esp. refinery), and particular transport subsectors.

The various parts of undertaking a pricing study will be presented within the context of reviewing the terms of reference for the World Bank study.

The terms of reference (TOR) for the upcoming World Bank study are presented in Annex F (in Spanish). The TOR presents five points:

1. information collection;
2. price analysis;
3. development of alternative future price scenario;
4. evaluation of alternative scenarios (impact analyses); and
5. recommendations.

The information collection effort outlined only refers to present petroleum product prices and use patterns. This work should at least be expanded to include examination of: (1) historical data, (2) detailed use patterns, i.e., by industry and transport type rather than sectoral aggregates, (3) macro, sectoral and subsector activity level measures, and (4) the role of energy costs in total costs at the sectoral level and for some specific energy intensive users. This last category is quite broad in that it

will be useful for both price elasticity analysis (see below) as well as price impact analysis on different subsectors (including different consumer classes).

The price analysis in the TOR deals primarily with cost structure analysis of the refinery as well as petroleum marketing. In addition to this work there needs to be detailed analyses of (1) price elasticity of demand (conservation effects) as well as (2) cross elasticity of demand (substitution effects). These analyses involve both economic and technical issues and information requirements. For example, for substitution issues, besides relative price, the factors of different fuel use efficiencies and different fuel use equipment costs are important. Another issue which overlaps with price impact analysis is the analysis of energy costs in total costs on a sectoral and certain subsectoral levels. For example, the role of different energy sources for different consumer classes would be used as part of an examination of demand elasticity as well as an evaluation of the real income impacts of price scenarios. These impacts are part of the larger issue of the progressive or regressive nature of energy consumption taxes or subsidies, which in turn can be examined in the overall context of the relative impacts of different taxation schemes.

The third part which is price scenario development will require some work on policy formulation given the current lack of clear policies for the energy sector. This policy work is needed first before the price scenarios reflecting such work can be developed. This issue is very important.

The fourth part of the evaluation of alternative price scenarios covers the micro-economic impacts; however, there is not macro-economic impact work.

In general, there is no macro-economic work in the proposed project. There is clearly a major constraint, which is the availability of basic information and models, in performing such work. Nevertheless, this work is needed for several reasons. One is to properly explore the extent to which energy taxes can be used as a fiscal tool as well as the impacts of their use. A second issue is to obtain an overall, consistent view of all the sectoral and subsectoral micro impacts. This view would capture the cascade effects (how one sector's response to the price impacts effects other sectors). A third is to capture the overall impact on the macro economy--GNP, consumption, investment. Particularly useful in this work would be an input-output model.

Overall the role for AID would be in the area of following the beginning activities in pricing studies and more concretely identifying and assisting in filling major gaps. Such gaps will appear in terms of basic information or data as well as in some analysis or modeling. One possibility is the creation of an I-O model or performing some elasticity analysis. Such efforts would only require short-term technical assistance and the use of local personnel such as the UNAH group at the Instituto de Inv. Eco. or possibly within the Banco Central Department of Economic Studies.

Annex E

Institutional Capacity for Energy Related Analysis

The following are my notes and impressions concerning the capacity for this analysis in Honduras. First a list of the possible sites for such work:

In Government	Out of Government
Ministry of Economics	Universities--UNAH and institutes
Ministry of Commerce, Public Works, Transport	Prof. assoc.--Colegio de Economistos
Banco Central	Private sector/consultants
ENEE	
COHDEFOR	
CONSUPLANE	
Ministry of Finance	
Ministry of Natural Resource	

There appears to have been little analysis performed by any group. Nearly all work has been of a descriptive nature; this is partially due to the unavailability of information on which to base such an analysis. This descriptive aspect characterizes the work of CONSUPLANE, the Central Bank and the university. The Ministry of Economics and ENEE perform some economic analysis as part of their pricing work; however, ENEE farms out nearly all of its work to foreign firms and the Ministry of Economics' work (in the Oficina Comercializadoro de Petroleo) is minimal because of a very limited staff.

Brief comments on some of these organizations follow:

CONSUPLANE--Ochoa's group appears to have at least one economist; he may be able to tap the larger resources of CONSUPLANE.

Institutio de Investigacionas Economicas y Sociales (UNAH)--this group can probably put together more resources in terms of personnel than any other one. Although their quality and experience is unclear, the interest will be high. The work I have seen is quite good in terms of information collection and description but there is not much, if any, quantitative analysis. However there seems to be at least an overall understanding of the energy sector and major issues by Miguel Ange Funes at the Institute.

The Comision de Ahorro holds occassional meetings and has one part-time staff member.

The Oficina de Comercialyzcion de Petroleo consists of two economists. This office works on refinery economics and petroleum transport issues.

Banco Central de Honduras--At the BCH, energy related work is performed in the Department of Economic Studies which is headed by Miguel Calix. We spoke with Jorge Castellanos who is in charge of the energy-related studies in this department. He is an economist but spends only about 20 percent of his time on energy work. He has some assistants for data collection. This group seems to have focused primarily on data collection and has performed no specific energy-related analysis. This group is working on refining industrial activity related information, and may have the necessary information for I-O model work. Costallanos felt that there was the in-house capacity to perform work such as I-O development or oil price elasticity with some expert assistance; however, he also felt that there was little interest in such work.

ENEE--does not seem to have much capacity nor interest in developing it.

Annex F

TERMINOS DE REFERENCIA

ESTUDIO Y EVALUACION DE LAS PRACTICAS ACTUALES EN MATERIA DE FIJACION DE PRECIOS Y GRAVAMENES SOBRE EL PETROLEO

I. ANTECEDENTES

1. Honduras no tiene producción nacional de petróleo. Consecuentemente, todo su petróleo y productos derivados del petróleo son importados para suplir la demanda interna. El crudo importado es procesado en una refinería propiedad de Texaco Trader International.

2. A pesar de las medidas de control de energía dictadas por el gobierno y el promedio decreciente de crecimiento en el volúmen de importación de combustibles provenientes del petróleo, el valor de tales importaciones continúa aumentando considerablemente. Las importaciones de petróleo, por ejemplo, se han elevado de cerca de $USA 25 millones en 1972 a más de $USA 100 millones en 1979 y se espera que alcanzarán la suma de $USA 150 millones en 1982. Estos desembolsos crecientes en la importación de petróleo, están creando presiones serias en la balanza de pagos de Honduras.

3. En toda la variedad de los productos refinados en Honduras, no se conocen los costos por tipo de producto. Para efecto de cálculo en costos, se considera solamente el costo total en función de las operaciones globales de la Refinería.

II. OBJETIVO

El objetivo primordial del estudio es proveer al Gobierno de Honduras de una evaluación comparativa de los efectos económicos, fiscal y social de su política existente de comercialización y tributación del petróleo. Elaborada la evaluación, presentar tres o cuatro alternativas estratégicas en el corto y largo plazo.

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III. TERMINOS DE REFERENCIA

Como una base para evaluar la política existente y alterna de comercialización, el estudio debe incluir los siguientes puntos:

1) Recolectar información completa en los precios de productos de petróleo existentes (refinación interna, importaciones productos acabados y crudos, impuestos, costos de transporte, mercado, distribución y otros) y patrones de uso para la línea completa de productos derivados del petróleo consumidors en Honduras como ser gas licuado de petróleo, gasolina super y regular, kerosina, av-jet, diesel y bunker "C".

2) El análisis de precios debe incluir:

   a) Los mayores y varios grupos de consumidores: industria, agricultura, transporte, gobierno y otros sectores por zonas geográficas establecidas.

   b) Análisis de costos de producción por tipo de productos en función de la capacidad instalada de la refinería existente.

   c) Evaluar los diferentes costos y márgenes de utilidad para cada uno de los canales que intervienen en la comercialización interna.

   d) Además, deberá incluir una exposición razonada de comercialización referente a la economía, distribución del ingreso, otros propósitos y sus costos económicos.

3) Desarrollar tres o cuatro alternativas de precios (ex-refinería-consumidor) e impuestos basados en: a) reflejo completo de la oportunidad internacional de costos, b) aumento al máximo de la contribución fiscal del sector energetico sujeto a metas de distribución de recursos y c) protección de las necesidades básicas de grupos consumidores de bajos ingresos y otras metas nacionales económicas y sociales.

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4) Comparar los efectos de las alternativas estratégicas de corto plazo (5 años) y largo plazo (10 años) son: a) total tratamiento energético; b) tratamiento ene energético por sector y productos; c) inversión requerida para producción energética, producción de energía, capacidad de la refinería, distribución, infraestructura etc; d) el total de recursos fiscales producidos y e) el efecto en el presupuesto familiar de personas de bajos recursos del sector urbano y cualquier otra meta nacional económica y social. Una comparación con los precios de los otros países centroamericanos debe ser también llevada a cabo.

5) En base a la comparación anterior, recomendar una estrategia apropiada de comercialización con programas que afronten gradualmente cambios de precios, en caso de ser apropiados. Además, el Consultor deberá recomendar cualquier estudio futuro, particularmente basado en impuestos sobre energéticos en sectores específicos de consumo de energía o posible desarrollo local de recursos que sería provechoso para sostener los esfuerzos de Honduras en el planeamiento de energía a largo plazo.

IV. ORGANIZACION Y DURACION

1) El Ministerio de Economía que es el encargado de regular los precios en la comercialización interna de los productos derivados del petróleo, será responsable total de la organización e implementación del estudio. Dicho Ministerio tomará las medidas para proveer el personal de la contraparte como sea necesario.

2) Se contempla que el estudio sea preparado en un período de seis (6) meses contados a partir de la fecha de asignación, debiéndose realizar en tres (3) etapas.

   a) Recolección de información y preparación de un reporte interino,

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b) Revisión del reporte preliminar, y

c) Análisis y preparación más amplia del reporte final

V. PRESENTACION DE OFERTAS

1.- El licitante deberá presentar su oferta en dos sobres sellados, uno conteniendo la oferta técnica y el otro la oferta económica del contenido y la leyenda: Propuesta-Convenio BIRF - HO No. 1861.

2.- Las ofertas deben ser presentadas en español.

3.- La oferta técnica deberá contener la siguiente información:

a) Metodología propuesta para la ejecución del estudio

b) Cronograma de ejecución detallando las fases y tipos de especialistas que intervendrán en éstas.

c) Lista de los especialistas que serán asignados al estudio con sus correspondientes Curriculum Vitae

d) Un resúmen de la experiencia de la firma en estudios de carácter similar efectuados en los últimos 8 años, indicando los nombres de los clientes, fecha de ejecución y duración de los estudios.

4.- En la oferta económica se deberá especificar en forma detallada los costos consultar - mes, presupuesto de viajes, gastos generales y cualquier otro elemento de costos que se considere conveniente.

5.- La fecha máxima para la presentación de ofertas es el día 30 de abril de 1983, debiendo dirigirse a:

Ministerio de Economía
2do. Piso Banco de Londres y Montreal
Tegucigalpa, D.C., Honduras, C. A.

VI. PROCEDIMIENTO PARA LA ASIGNACION

1.- El procedimiento a seguir para la asignación será, en primer lugar el análisis de la oferta técnica y si las empresas califican en esta primera fase, seguidamente se analizará su oferta económica. De no llegarse a ningún acuerdo con la firma que califique en primer lugar, se negociaría con la firma que haya calificado en segundo lugar; si en esta segunda fase continúa el desacuerdo, se negociaría con la firma que haya calificado en el tercer lugar.

2.- La oferta técnica tendrá una ponderación del 80% y la oferta económica del 20%.

HONDURAN INDUSTRIAL ENERGY PROGRAM - U.S. AID

The only energy data available for this evaluation were found in the 1975 census. Examination of the statistics for industries offers some perspective for the foregoing statements. The census is broken down into industry types, using the Clasificacion International Industrial Uniform (CIIU) descriptions and code numbers which follow:

- Food and Beverages (non-commercial preparation) - 31
- Textile Products - 32
- Wood Products (lumber, finished goods) - 33
- Pulp and Paper Products - 34
- Chemicals (soaps, detergents, industrial chemicals) - 35
- Non-Metal Mineral Products (includes cement) - 36
- Metals - 38
- All Others - 39

Note that artesans, who use wood as their main source of energy, are not included in the statistics.

According to the data, about 85% of all the petroleum energy used by Honduran industries was confined to the CIIU Groups 31, 35, and 36. Food and Beverages accounted for 19%, Chemicals for 23%, and 43% was used in Non-Metals. The balance of the usage, in rank order, was in Wood Products, Textiles, Metals, and Pulp and Paper Products. Category 39, all other products, had such a small amount of pertroleum consumption as to be insignificant. Examination of the data by petroleum derivative type indicates

that over 90% of the fuel used is in the form of diesel or fuel oil, 23% and 70%, respectively. In terms of relative usage of diesel, the three top categories are Food and Beverages, Wood Products, and Chemicals. Fuel oil consumption is dominated by Non-Metals and Chemical industries, with the Food sector being the only other significant consumer. The energy balance prepared by CONSUPLANE for the same year shows a higher consumption of diesel relative to fuel oil; no attempt has been made to reconcile the difference, as the total consumption of both fuels is approximately the same magnitude.

Other derivatives, such as gasoline, kerosene, and LPG make up a small fraction of the total petroleum consumption by industries. Interestingly, wood is responsible for only 2% of the total industrial fuel energy supplied by combustible fuels, when calculated at its gross heating value. Accounting for losses due to inefficiencies, this contribution is not significant for the industrial sector addressed by the census which, as noted above, does not include artesan businesses.

Turning for a moment to the consumption of electrical energy by industry, one finds that the consumption by CIIU category is somewhat different than for petroleum products. Food industries remain a major user at 30%, but the Textile industry ranks second at 28%. The other groups rank, in order: Non-Metals (18%), Chemicals (11%), Wood Products (8.1%), Metals (2.8%), and Pulp and Paper (2.4%). These data indicate a heavy reliance upon electricity by the textile industry (48% of total raw energy used), while the other industries remain predominately fossil fuel users (greater

than 70% supplied by petroleum). This tendency does not give rise to concern for industrial energy use unless the textile industry expands considerably in the future, as the number of larger firms is inconsequential at present. But future predictions of electric power demand by Honduran industries should consider the growth of these industries.

Viewing total raw energy consumption by industry, both petroleum derivatives and electricity, one finds that the three top users remain Non-Metal (40%) Food and Beverages (21%), and Chemicals (21%). The rank order for total energy usage for other groups is the same as for petroleum usage: Wood Products, Textiles, Metals, and Pulp and Paper.

While the above referenced statistics are based upon eight year old data, it is probable that the relative distribution of usage for industry is still the same at present. Some substitution of fuels may have occurred (such as electricity for petroleum products, or alternative fuels such as biomass), but not to the extent that the basic reliance upon petroleum products by industry has been altered significantly. National consumption figures for petroleum derivatives support this assumption. So it remains an important objective in Honduras to reduce the reliance of industry upon petroleum derivatives, and to lessen the economic vulnerability imposed by the volative petroleum products market. Achieving this objective will enhance the competitiveness of Honduran industries in regional and world trade and will strengthen export earnings.

The best short term tactic to bring about reduced consumption of petroleum products is to formulate and initiate a national energy conservation program. Such a plan should include the residential, commercial,

and transportation sectors, but particular attention should be given to the industrial sector. This is because industry has generally more options for energy conservation, and can be fairly flexible in terms of implementing energy conservation measures without affecting production. Additionally, the cost-conscious industrial sector is more likely to recognize the profitability of energy conservation from a competitive market standpoint.

Based upon the preceding discussion related to industrial consumption of petroleum derivatives, such an industrial energy conservation plan should focus upon the major users, i.e., Food and Beverages, Chemicals, and Non-Metals. Modest reductions in energy consumption by these groups would be reflected in significant decreases in the use of petroleum in the industrial sector, because of their total combined share of consumption of these fuels. If an across-the-board reduction in petroleum usage of 10% could be achieved by the large industrial users through an energy conservation program, the resulting savings would exceed 4.0 million dollars annually. The U.S. AID mission should take every opportunity to encourage the establishment of an energy conservation plan to realize such a significant energy savings in Honduras.

REGIONAL INDUSTRIAL ENERGY EFFICIENCY PROGRAM

ROCAP/ICAITI

A major step in providing the necessary technical support for a national energy conservation plan has been initiated by ROCAP/ICAITI. Through their efforts, a five year program of in-plant technical assistance, technical training, and technology transfer will be provided for the Central American countries of Guatemala, El Salvador, Costa Rica, Honduras, Nicaragua, and Panama. Its purpose is to infuse into the local economy of each country the technical expertise and financing mechanisms necessary to bring about improved industrial energy utilization. Approximately $8 million has been authorized to conduct the regional program, of which $6 million was provided by AID/Washington. Within the total scope of the program are in-plant energy audits, demonstration projects, pilot plant demonstrations, seminars and exhibits, and technical training for ICAITI staff and other appropriate personnel. Also, a study will be made of the financial and institutional issues and mechanisms which can be used to promote investment and implementation of energy efficient industrial technology.

Program participants will consist of ICAITI staff in Guatemala City, ICAITI field representatives, and appropriate public-sector personnel. The Secretariat for Central American Economic Integration (SIECA) has been included as a partner in the program to access the financing and policy issues which could affect a successful energy conservation program. In addition, care has been taken to provide for participation in each country

of recognized Chambers of Industry which represent the industrial community.

A regional consultative committee will be formed from representatives of the program participants, to assist the project director in planning for promotion and field extension work. Selected major industry representatives will join ICAITI, SIECA, Regional Federation of Chambers of Industry (FECAICA), and the Central American Bank for Economic Integration (CABEI) in the make up of the regional committee.

Each Central American country will have a national consultative committee to assist in coordinating the program on the national and local levels. In Honduras, this committee would consist of one representative from the membership of the National Association of Industries (ANDI), one government representative, two representatives of the financial community, and the ICAITI field representative in Tegucigalpa. This committee membership is not yet fully decided, but represents the current proposed composition.

During the five year period from 1982 to 1987, about 535 direct actions will be accomplished by the program. Direct actions consist of in-plant energy audits, demonstration projects, pilot plant installations, technical seminars, and exhibits. Through the multiplier effect commonly associated with such direct actions, an estimated 3,600 industries will be reached. Energy savings for the region as a result of the program are projected to approach 11%.

In the first months of the program, ICAITI staff engineers and field representatives will undergo an extensive training program in industrial

energy conservation practices and methods. This training will enable the ICAITI personnel to conduct subsequent technical assistance and training in each Central American country, thus developing the local capability to utilize current conservation technologies. Ideally, such an approach will "bootstrap" the industrial energy conservation programs of each country without depending upon continued support by ROCAP beyond the fifth year.

Once sufficient technical skills have been developed by the in-country teams, a series of in-plant energy audits will be undertaken. They will consist of brief, qualitative plant visits (Level 1 audits) which point out easily recognizable opportunities for savings, and more detailed, quantitative examinations (Level 2 audits) of energy usage and energy balances. The Level 1 surveys are designed to achieve early, high-impact results for the program which will aid in its acceptance and success in each country. Level 2 audits will be less in number and will only be provided for carefully selected industrial sites which show promise for energy savings beyond those obtainable through a Level 1 audit.

In-plant demonstration projects will be undertaken, a total of 85 over five years. They are to consist of minor plant improvements such as the installation of gauges, meters, controls, or spare parts, and major modifications such as the design and installation of a major piece of capital equipment. Such demonstrations will show that appropriate measures, properly designed and implemented, can bring about significant industrial energy savings.

A total of two pilot-scale demonstration projects will be designed and built during the life of the program, to demonstrate and promote new tech-

nologies which could have a significant impact upon the energy use of the region. One promising possibility is the use of renewable biomass fuels to provide energy for an industrial process, beyond the typical applications found today at sawmills and on sugar plantations. These pilot plants will not be duplicates of any planned or ongoing projects in the countries selected as sites.

Seminars and exhibits will make up the balance of the direct actions planned for the program. Approximately four seminars will be conducted in each country each year, by members of the ICAITI field staff in each country. The objective of the seminars and exhibits will be to promote the program to the industrial community, to point out the services available through the program and in the private sector, and to acquaint the participants with opportunities for reducing operating costs through energy conservation.

AID/HONDURAS PARTICIPATION

IN INDUSTRIAL ENERGY CONSERVATION PROGRAMS

Upon examination of the ROCAP/ICAITI program for regional industrial energy efficiency, one can see several opportunities for AID/Honduras to assist in the successful implementation of the program. These functions consist of program promotion, program evaluation, some advisory functions, and advice to the Honduran government on how to best take advantage of the services being provided. The following paragraphs are suggestions for possible AID involvement in the project.

- Advisory Functions

  The concept proposed in the ROCAP/ICAITI Project Paper (PP) for a national representative consultative committee to provide advisory recommendations for program actions is well conceived and should have good results. However, it might seem that a larger, more diverse group than the one presently proposed could give the program more exposure and a higher probability of acceptance. Noticeably lacking are representatives from the National Electric Company (ENEE), the academic community, professional trade associations, the Industrial Development Center (CDI), and AID/Honduras. While it is true that a large group is generally less efficient in an advisory capacity than are smaller ones, task groups composed of fewer representatives could be formed to handle operation-level functions. This would allow for the greatest degree of participation by national and local organizations, while

preserving the integrity of the small group system. It seems especially important to involve members of the academic profession who are engaged in instruction in the sciences and engineering. They have the potential to create a valuable national human resource which will be able to effectively deal with energy related issues, by including energy efficiency topics in their curricula. AID/Honduras should discuss with the Honduran ICAITI representative the possibility of structuring the national cunsultative committee along these lines.

- Participant Selection

The PP identifies several target industries to be aided by the program. The selection of the Food and Beverage industry and the Chemical industry is highly appropriate based upon their petroleum consumption nationwide. Textile firms are also selected, but they seem to have a much smaller influence on energy consumption, as was discussed in the PP. From the industrial census data, it appears that the Non-Metals sector (which includes the cement industry) consumes a substantial portion of the industrial petroleum in Honduras, but is not included as a candidate industry in the PP. This is explained in the Project Paper based upon the major effort which is required to convert the cement industry from wet to dry processing and the appropriate efforts of the program. But such a large consumer certainly merits some attention, and AID should seek to find a way to offer technical assistance to this sector through consultation with the ICAITI Honduras field representative.

- Promotional Activities

  Perhaps the greatest potential for AID/Honduras involvement in the program lies in the area of program promotion. Through its multitudinous associations with government and local organizations, AID can have a significant effect upon public awareness and acceptance of the program. The ICAITI field office and ANDI can successfully promote the program in the private sector, but ICAITI should share the promotional activities with AID/Honduras for best overall results.

- Evaluation of Program Results

  A brief discussion of program evaluation is included in the PP. It appears to consist mainly of reviews and checks of major program progress and milestones. Not apparent in the document, however, is a method for evaluating the program impact based upon actual, verified savings realized by industry as a result of program actions. Also included should be some evaluation of the industrial sector's response to policy and financing issues addressed by the program. Such an evaluation is a very valuable tool in judging the success of an intervention-type project. Perhaps the PP was purposely broad in the definition of this component, to allow for refinement as the program progresses. But AID should offer to assist in such an evaluation, and should work cooperatively with the project team to assure the adoption of a comprehensive evaluation if one is not already defined.

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H. Z. Jackson
Tegucigalpa, Honduras
June 24, 1983

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