INTERNATIONAL ENERGY WORKSHOP
A SUMMARY OF THE 1983 POLL RESPONSES

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PREFACE

The International Energy Workshop (IEW) is an expanding network of analysts concerned with international energy issues. Jointly created in 1981 by IIASA and Stanford University, the IEW aims to compare published energy projections and to understand the reasons for their divergence. The Workshop process includes iterative polling of projections of crude oil prices, economic growth, primary energy consumption and production, and energy trade. Successive meetings assess the implications of the comparative projections in the presence of most of the poll respondents.

This report by Professor Manne of Stanford University and Dr. Schrattenholzer of IIASA describes the results of the 1983 IEW poll, which served as background to the second meeting of the IEW held at IIASA in June 1983.

HANS-HOLGER ROGNER
Leader
Energy Development, Economy,
and Investments

International Energy Workshop: A Summary of the 1983 Poll Responses

Alan S. Manne and Leo Schrattenholzer***

INTRODUCTION

Energy forecasting is a hazardous occupation. Virtually any projection is doomed to be incorrect. Opinions can swing from one extreme to another during a six-month period. Our paper is not intended to provide still another projection, but rather to try to explain why different individuals and organizations arrive at divergent views on the long-term energy outlook—and therefore differ on policy decisions.

This paper is an interim report on the current activities of an informally organized group known as the IEW (International Energy Workshop). The general aim is to compare the most up-to-date, long-term energy projections available throughout the world, and to obtain a better understanding of the reasons for their differences. Participation is open to any individual who is prepared to contribute to the aims of the IEW. Usually, such a contribution consists of summarizing one or more energy scenarios by filling in the poll form shown in Appendix Table A-1. The first workshop meeting was held at Stanford University in December 1981, and the second at IIASA (the International Institute for Applied Systems Analysis, Laxenburg, Austria) in June 1983.

The poll covers only items that are comparable in existing international energy statistics: crude-oil prices, GNP growth, primary energy consumption and production, and electricity generation. Typically, the respondents provide a reference case ("surprise-free") scenario. In a few instances, there are disruption and/or alternative growth cases. No probability estimates are assigned to individual projections.

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Table 1. Number of Responses—IEW Regions

IEW Regions		*Number of Responses*
1	USSR and Eastern Europe	11
2	China and other Asian Planned Economies	10
3	Centrally Planned Economies	10
4	OECD	28
5	OPEC	23
6	NODC (Non-OPEC Developing Countries)	20
7	Market Economies, Subtotal	22
8	World, Total	17
9	Individual countries/regions, not elsewhere classified	187
	Total	*328*

The poll responses are grouped according to a standardized list of eight world regions and a large miscellaneous category (individual countries/ regions). Table 1 shows the identification of these regions and the number of responses that were received for each. By comparison with the 1981 poll, there has been a significant improvement in IEW coverage of the centrally planned economies and the developing countries. In this brief summary report, we cannot do justice to each of the 328 poll responses that have been received. We can only report our preliminary impressions.

The poll does not require a participant to provide all items shown in Table A-1. Thus, far more responses were received for 1980–2000 than for the year 2010. This suggests that most of these analyses are concerned with short-and intermediate-run decisions (e.g., specific investment projects), rather than with long-term questions (e.g., resource depletion, global carbon dioxide emissions, and technology development). Each type of decision requires a somewhat different time horizon and level of detail.

Table 2 summarizes the total number of responses received for each category. Most participants provided projections of GNP, total primary energy and oil consumption, but fewer included details on the other primary energy sources: natural gas, coal, hydroelectric, geothermal, and nuclear. A still smaller number of the respondents provided estimates for "solar and other renewables." In some instances, estimates for this category were combined with hydroelectric, geothermal, and other sources of energy. Item 17 (electricity generation) was added to the poll at a late date. This may explain why there has been a fairly low response rate on this item. An alternative explanation may be that electricity is "secondary" rather than primary energy, and is therefore not analyzed explicitly in all international energy projections.

Among the 78 respondents, there are governmental and international agencies, oil companies, research institutes, universities, and individuals.

Table 2. Total Number of Responses[a]

	1980	1990	2000	2010
Number of entries for each item:				
International price of crude	220	197	197	72
Real GNP (or GDP)	251	219	223	73
Total PE consumption	265	233	244	68
Total PE production	189	184	198	68
Oil consumption	274	250	244	72
Oil production	241	243	240	72
Oil exports—imports	230	247	234	69
Natural gas consumption	233	202	210	66
Natural gas production	192	187	200	66
Natural gas exports—imports	167	180	181	64
Coal consumption	233	203	212	68
Coal production	186	181	196	68
Coal exports—imports	164	177	179	65
Hydroelectric and geothermal	224	199	209	67
Nuclear energy	234	208	217	66
Solar and other renewables	127	124	125	64
Electricity generation	127	152	162	57

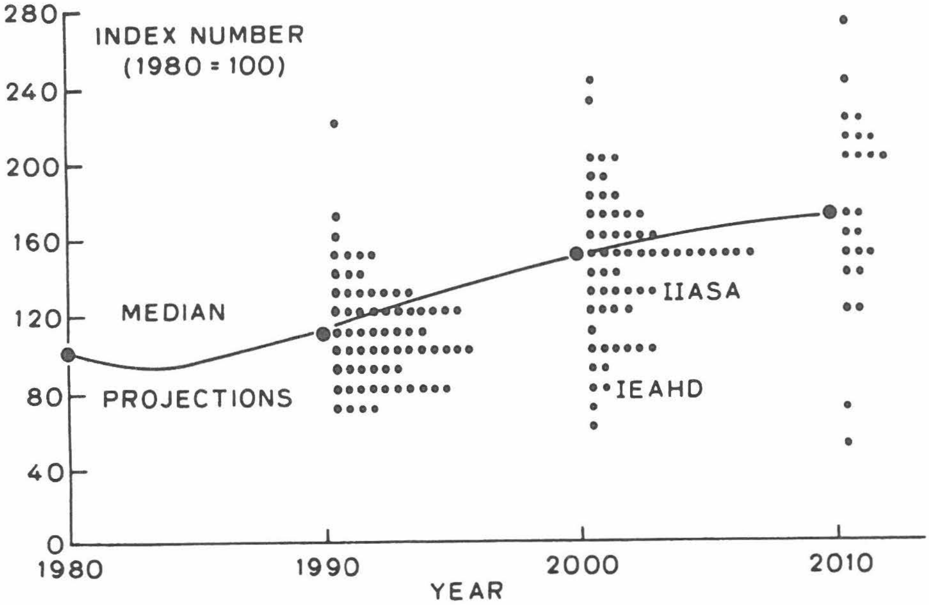
[a]Total number of responses: 328.

Both the "conventional wisdom" and minority viewpoints are represented among the groups shown in Table A-2. Each has been assigned an abbreviation containing three to five alphanumeric characters. For example, the IEA (International Energy Agency) provided both a "high demand" and a "low demand" scenario. These are denoted, respectively, by IEAHD and IEALD

Only a few of these responses are derived directly from formal models. Most are the outcome of judgment and extensive discussions within individual organizations. This type of informal process is flexible and has many other advantages but makes it difficult to trace the reasons for differences between individual projections. We cannot do justice to this issue here but hope to make some progress by the time of the next IEW meeting in June 1985.

POLL RESULTS—INTERNATIONAL OIL PRICES

Taking all regions together, there are 61 independent projections of the international price of oil for the year 2000. All are reported in currency units of constant purchasing power, and as index numbers with 1980 = 100. Index numbers rather than monetary units are used for both oil prices and GNP. This avoids some definitional problems, and increases the comparability of the poll responses.



Respondent	1990	Respondent	1990	Respondent	2000	Respondent	2000	Respondent	2010
respb	223	criep	110	stols	240	criep	148	bnl	266
ipe	173	tea	109	ipe	229	DRIE	147	iemf	243
trac3	164	smil	105	dnmoe	201	DOE	146	etsld	225
stols	155	cal	102	etsld	200	czmoe	146	cerg	215
obenb	150	assu	102	cecct	199	tea	141	pilot	213
obena	150	polas	100	mkr	191	swea	141	fsz	213
etsld	150	merz	100	nzmoe	188	iiasa	139	DOE	213
ceoct	141	jaeri	100	ewrsi	182	ift	135	par	200
iiasa	139	hnpb	100	iemf	181	emcn	135	nzmoe	200
nzmoe	138	DRIE	99	fsz	181	ieald	132	criep	199
mkr	134	3rt	99	obenb	175	cal	131	opecl	196
iemf	134	ieald	98	obena	175	smil	130	jaeri	175
esc	134	cec	97	bph	175	merz	130	etshd	175
atw	134	pilot	96	bnl	172	assu	122	assu	165
par	130	respa	94	doe	168	paec	122	tea	164
ewrsi	128	eia	94	esc	163	polas	120	smil	150
wbk	126	ece	92	3rt	161	respi	117	polas	150
swea	125	cerg	90	par	160	hnpb	110	leob	150
etshd	125	eni	86	cerg	160	bpl	105	ift	144
dnmoe	125	ceceu	86	pilot	157	iea83	103	iiasa	139
gri	125	trac2	85	emch	156	seri	100	paec	122
stohs	122	cies1	85	wbk	154	oriea	100	hnpb	120
ift	120	cies	85	smie2	154	ceceu	97	ciesl	68
bph	120	ieahd	82	smie1	154	ceccp	97	ciesh	50
fsz	119	DOE	81	gri	153	cec	93		
cecfc	118	leob	80	respa	153	cecfc	88		
trac1	116	iee	79	stohs	150	respb	84		
emch	116	bnl	78	leob	150	ieahd	82		
doe	115	iea83	77	jaeri	150	ciesl	73		
czmoe	115	ceccp	76	etshd	150	ciesh	62		
candd	110	ciesh	75	opecl	148				
paec	110	bpl	75						
opecl	110	shell	73						
emcn	110	respi	71						

Figure 1. International price of crude oil (1980 = 100).

The individual oil-price estimates differ widely—in extreme cases by a factor of three. Each estimate is shown as a dot in a frequency distribution (Figure 1). With only a few exceptions, the respondents indicated that real oil prices will rise from their 1980 level—and at a more rapid rate during the 1990s than during the 1980s. Typically, this reflects the view that those forces leading to price increases (demands increased by economic growth and supplies reduced because of the gradual exhaustion of conventional oil and gas resources) will be stronger than those exerting downward pressure on oil prices (conservation responses to the events of the 1970s and the introduction of alternative forms of energy supply). The median value of all responses is 148 in 2000, equivalent to an average annual price increase of 2.0 percent from 1980 onward. Clearly this result is incompatible with the view that the 1983 oil glut was a "structural" phenomenon, and that low prices will persist indefinitely.

With a little detective work, it is possible to narrow the range of the possibilities considered here. For example, one of the lowest responses is IEAHD. This represents a "what if?" scenario. The IEA assumes that real oil prices will decline between 1980 and 1985, and then will remain stable through 2000. Under these circumstances, oil demand is stimulated and begins to exceed supplies during the 1990s. This represents an instructive thought experiment showing the consequence of "too low" an oil price, but it is not a logically consistent scenario. By contrast, consider the same organization's low-demand case (IEALD). Through side calculations, it can be shown that the IEA's global supply–demand gap would have been reduced to zero if the agency had assumed a price level that is close to the poll median results.

Here is a second example of analytic structure determining the poll response. Underlying IIASA's 1981 publication *Energy in a Finite World* was a good deal of optimism on the costs and speed of market penetration of synthetic fuels. It was believed that tar sands, shale oil or coal-based synfuels could expand rapidly in North America, and that their costs would be about 40 percent higher (in real terms) than the 1980 price of crude oil. This explains why IIASA's initial poll response (the "low" scenario of 1981) indicates a 1990 crude-oil price index of 139 (with 1980 = 100) and why the index remains at that level through 2010. In effect, synthetic fuels serve as an international "backstop" technology in the original study. This leads to stable world oil prices—and no increase in the OECD region's net demand for oil imports. More recent IIASA calculations (identified as IIA83) have arrived at somewhat different conclusions.

Through the IEW process, we hope to systematize this type of analysis. Each participant is urged to provide conjectures as to why stated projections deviate from the poll medians. Some of the deviation may turn out to be errors in reporting or transcription. Others may be connected with definitional differences in regional or product coverage. In other cases, there may be explanations that can be related directly to model structure. Another round of polls and discussions would help to distinguish the effects of assumptions, statistical categories, and analytic features.

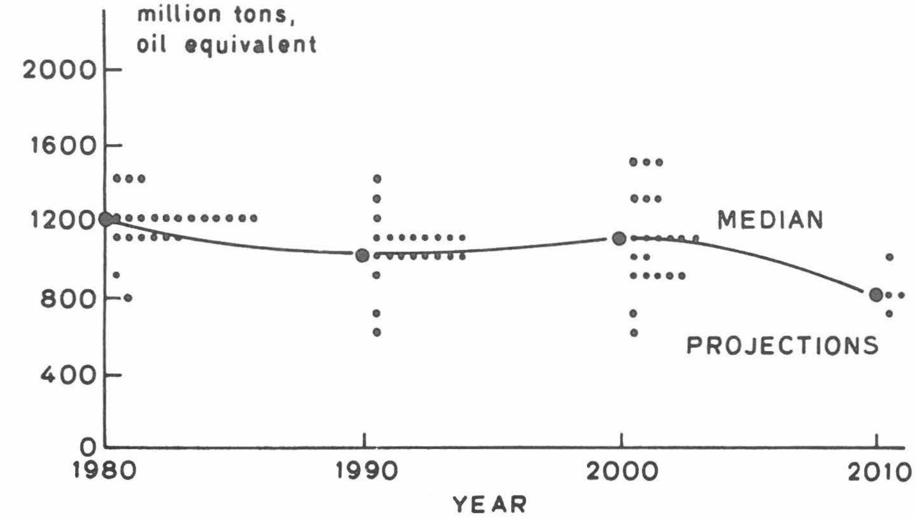
Cynics will be quick to point to other possible explanations for these differences. Long-term projections may be heavily influenced by current events. For example, there was an oil glut during the 18 months that elapsed between the 1981 and 1983 workshops. Between these two polls, the median oil-price projection for the year 2000 declined from 175 to 148 (in real terms, with 1980 = 100). The statistical significance of this result is a bit doubtful, because the sample was not identical in both cases. Moreover, one would expect this type of decline if oil prices are following a random-walk pattern. Through autocorrelation, projected prices are then affected by the current level. Nonetheless, the cynics may be right. Just as in macroeconomic forecasting, there is a strong herd instinct that operates within the community of energy analysts. In any case, the workshop process is bound to lead to healthy introspection—and more attention to minority viewpoints.

IMPORTS AND EXPORTS—OIL AND GAS

Because oil is a liquid, it can be transported at lower specific costs than either natural gas or coal. Until the distant future date when there are large-scale movements of methanol and/or hydrogen, it is generally believed that oil will retain its present position as the principal fuel in international trade. Because oil constitutes a "swing" fuel, small differences in a region's total energy production or consumption can lead to large percentage changes in the quantities of oil imported or exported.

Measurement problems turn out to be quite serious when we attempt to compare oil import and export projections. Within the OECD region, for example, there are wide discrepancies between the individual responses for the statistical base year of 1980 (Figure 2). These differences account for some of the range in import projections in subsequent years. The discrepancies in measurement are probably more significant than the changes in the median. It would be useful to determine how much of these differences can be traced to statistical difficulties in distinguishing between crude oil and refined products, and how much is attributable to other factors, such as processing losses, stock changes, and bunkers.

Figure 3 summarizes the workshop's median estimates of interregional shipments of oil and gas. (Coal shipments are insignificant at this level of regional aggregation. A more detailed geographical breakdown is needed in order to analyze coal trade.) The poll provides an automatic global consistency check between independent estimates of interregional trade. From the positive and negative entries in Figure 3, we find that the export and import totals are in reasonably close balance. Looking at the poll responses on a nation-by-nation basis, however, there is evidence that the growth in NODC oil imports may be understated.



Respondent	1980	Respondent	1990	Respondent	2000	Respondent	2010
sohn	1442	stohs	1395	aohn	1499	opecl	1050
stols	1360	sohn	1253	oriea	1475	iiasa	842
stohs	1360	bph	1190	ieahd	1454	cerg	805
opecl	1210	ieahd	1140	stohs	1310	DOE	725
DOE	1185	gulfb	1125	gulfb	1285		
ipe	1181	respa	1112	bph	1267		
cerg	1181	wbk	1109	opecl	1145		
ieald	1180	opecl	1107	ind	1145		
ieahd	1180	eni	1094	wbk	1122		
iea83	1180	stols	1090	iea83	1113		
bpl	1171	iea83	1068	con	1087		
bph	1171	DOE	1025	ipe	1056		
gulfb	1170	cerg	1020	cerg	993		
wbk	1155	ipe	1015	3rt	980		
ind	1155	respc	1010	DOE	935		
eni	1148	ind	1010	respa	896		
con	1144	con	995	stols	875		
respc	1135	ieald	975	ieald	872		
respb	1112	bpl	974	bpl	872		
respa	1112	3rt	940	iiasa	726		
3rt	1085	iiasa	712	respb	613		
oriea	876	respb	608				
iiasa	797						

Figure 2. OECD oil imports (mtoe).

During 1980, the CPE (centrally planned economies) maintained net exports of oil to the market economies, but these quantities were quite small in relation to OPEC's export volume. According to most of the poll participants, there will be a declining trend of net oil exports from the CPE, and they might become net importers of oil by the year 2000. Even at that point, the CPE will be largely self-sufficient in energy, and will substantially increase their gas exports to the OECD. International energy markets will continue to be dominated by the oil trade between just regions—OPEC and the OECD.

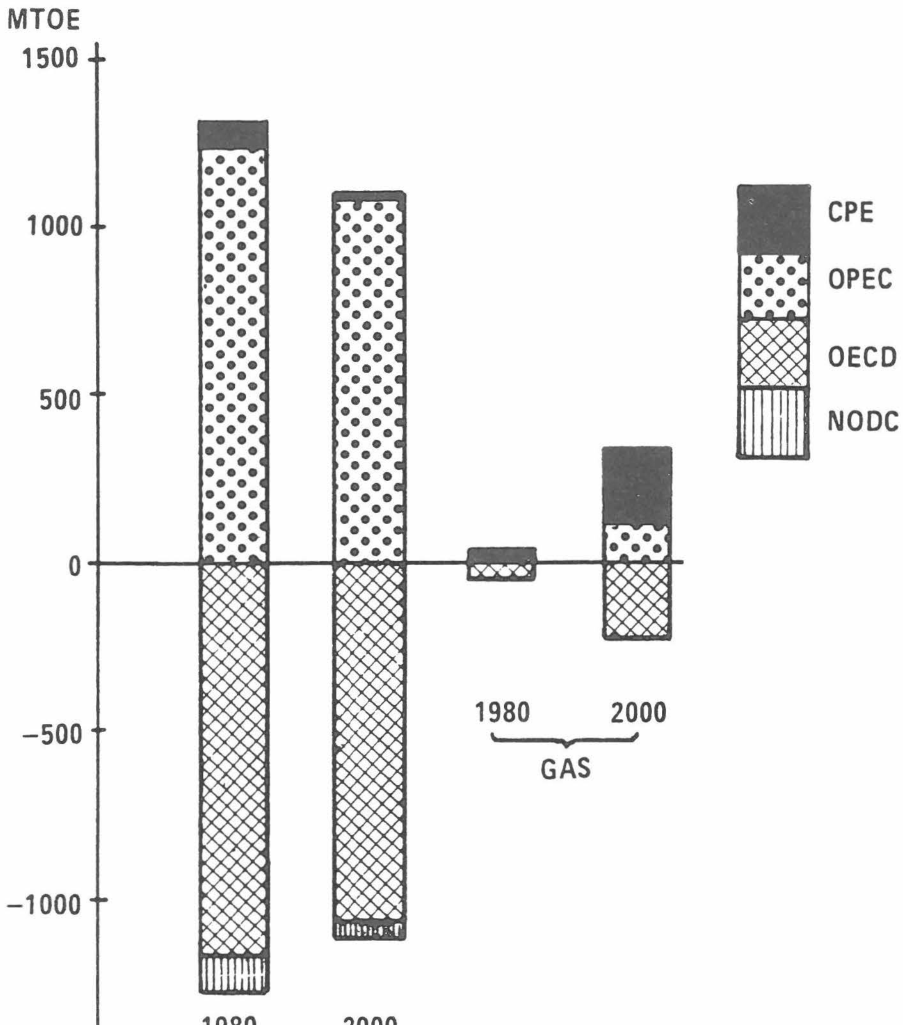


Figure 3. Exports–imports of oil and gas (mtoe).

NODC (non-OPEC developing countries) oil imports will depend upon their income growth and their balance-of-payment constraints. There is a diversity of opinion on whether these countries will choose to expand their domestic oil production, or whether they will shift to less energy-intensive lines of development than in the past. Very few of the poll participants have projected that the NODC group as a whole will be importing significantly more oil in the year 2000 than in 1980. The median indicates a decline. In assessing the significance of these results, it would be helpful to have more analysis undertaken by the NODCs themselves. Their research organizations are underrepresented within the poll.

ENERGY CONSERVATION, INTERFUEL SUBSTITUTION, AND RENEWABLE ENERGY

Figures 4 and 5 provide a global view of the median poll responses for 1980 and 2000 on total primary energy consumption and its breakdown into individual fuels. Each pair of bar charts summarizes one region's prospects for interfuel substitution and for energy conservation. These forces do not operate in an autonomous way. They are a direct consequence of the two oil-price shocks of the 1970s—together with the expectation of further oil-price increases.

Except for OPEC, it is projected that total primary energy demands will increase less than in proportion to economic growth. Conservation is defined here as a residual—the difference between the projected energy consumption in 2000 and the demands that would have occurred if the energy–GNP ratio had remained constant from 1980 on. Thus, conservation represents the combined effect of improved technical efficiencies and of changes in the economy's product mix.

The overall reduction in the energy–GNP ratio (expressed in terms of primary energy equivalent) is indicated by the conservation component at the top of each region's bar for the year 2000. In both centrally planned and market economies, *conservation* represents the largest single source of additional energy supplies for 2000. This was once a heresy, but is apparently the prevailing view today.

Interfuel substitution plays a vital role in explaining why virtually all organizations project significant GNP growth, despite little or no increase in global oil supplies. Natural gas, coal, and nuclear energy provide the principal sources of interfuel substitution, although their relative contributions vary from one respondent to another. A major increase in natural gas production is anticipated only within OPEC and the USSR.

There is general agreement that only a small contribution will be provided by the *renewables:* hydroelectric, solar, and biomass. This outcome of the poll may be attributed to the inherent limitations of technologies based on dispersed energy sources. It may also be attributed to definitional differences, because the 1980 base year responses vary quite erratically from one respondent to another. Clearly, it would be worthwhile to standardize these definitions and statistics. In any event, the IEW poll cannot be expected to resolve the highly charged controversy surrounding the renewables and the role that they might play as alternatives to coal and nuclear energy.

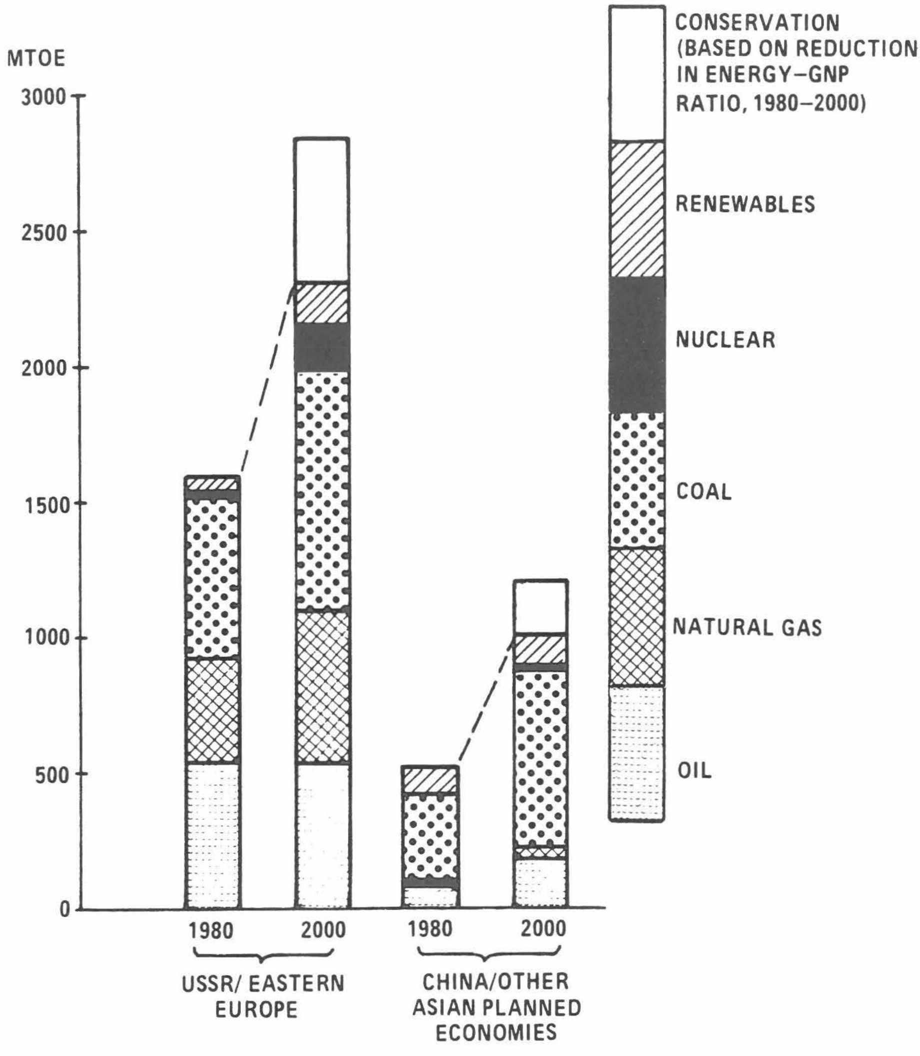


Figure 4. Total primary energy consumption—poll medians—centrally planned economies (mtoe).

WHY DO ENERGY PROJECTIONS DIFFER?

The following list offers reasons why energy projections may differ from one another. *No single factor explains all of the differences.*

- Errors in recording and transcribing; 1980 statistics;
- Date of projection;
- Time horizon of projection;
- Definitional problems;
- Model structure;
- Demand parameters, such as GNP growth, structural changes, regulatory approaches to conservation, price and income effects, final vs. primary energy demands, and the role of electricity;
- Supply parameters, such as conventional resources (geological resource base, producibility constraints) and unconventional fuels (costs and speed of market penetration;
- Philosophical differences, and
- "Stake-Holders": detailed information vs. inherent biases.

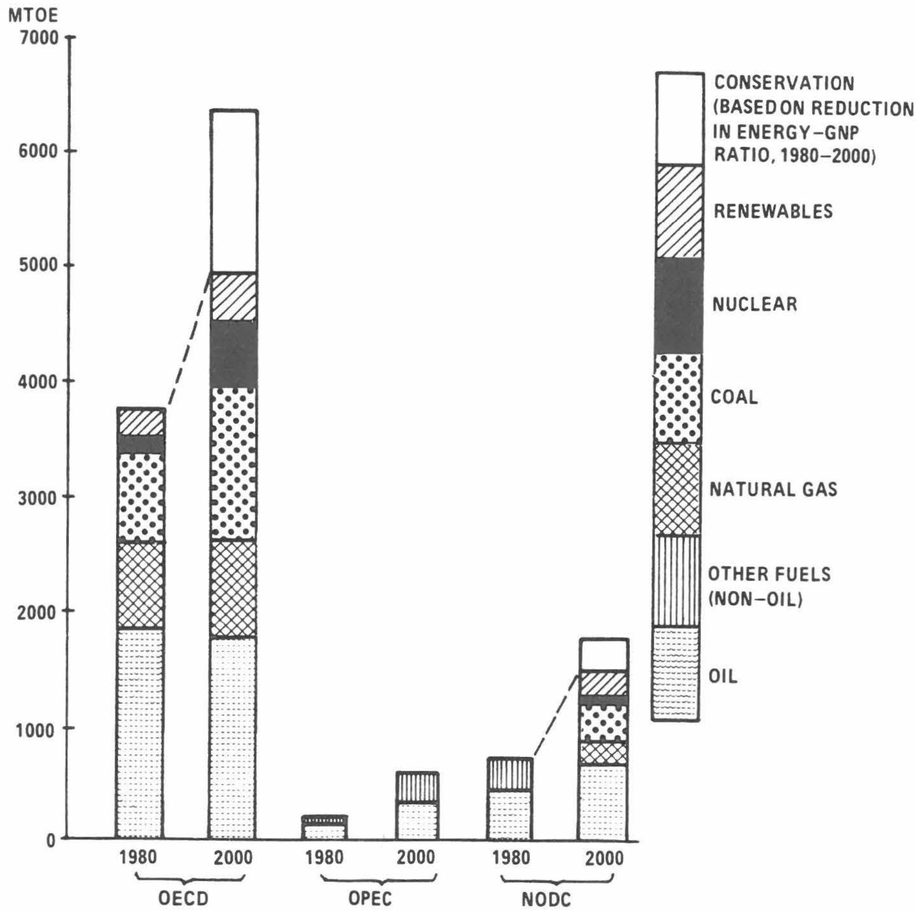


Figure 5. Total primary energy consumption—poll medians—market economies (mtoe).

First, there can be *errors* in recording and transcribing the poll entries. We have tried to be vigilant about this. Although confident that transcription errors are not a significant source of the differences reported here, we cannot guarantee to have detected all errors. Iterative polling can be helpful in identifying errors, and in reducing the differences between base-year (1980) statistical measurements.

The *date of projection* is a crucial element in attempting to understand why these estimates differ. Recent forecasters are not necessarily wiser than earlier ones, but at least they can take advantage of autocorrelation in the random-walk pattern that seems characteristic of energy time series.

The *time horizon of the projection* may also be a significant element. There is some evidence that the longer the time horizon, the lower the forecast of the total level of energy demands and the higher are oil prices.

Definitional problems are a major source of the discrepancies between individual projections. It is disturbing to see the wide range of variations in base-year (1980) statistics. Some of these variations are attributable to differences in the date of projection.

It is an open issue whether model *structure* (whether formal or implicit) can explain a large part of the variation in poll responses. Our personal conjecture is that far less is explained by structure than by differences in the numerical assumptions related to supply-and-demand scenarios. Additional work is needed in order to check this conjecture.

Uncertainties in GNP growth are frequently cited as a critical element in *demand* forecasting. Over the long term, however, these may be less significant than differences in price elasticities of demand, or in the response of individual energy consumers to centralized regulations that are designed to conserve energy.

Scenario assumptions may be equally critical on the *supply* side of international energy markets. Over the next two decades, it is not the ultimate resource base, but rather the producibility constraints (e.g., leasing and depletion policies) that will determine how rapidly the world's nonrenewable resources will be exploited. Moreover, international crises and supply disruptions may occur at any moment. These events cannot easily be predicted by conventional economic analysis.

In all of this, perhaps the most elusive factors are philosophical and ideological. "Stake-holders" have more detailed information available, but have an obvious interest in exaggerating the prospective rate of market penetration by their group's specific technology. Similarly, political leaders are prone to adopt optimistic targets for their nation's or region's GNP growth. Another factor is the personality of the individual forecaster. Some have an inclination to focus upon good news, and others prefer to predict that doomsday is at hand. (These two attitudes seem to be the psychological opposite of the "herd instinct.")

In short, there are many imponderable elements that may even unconsciously influence projections. But we also believe the converse to be true—that the IEW may exert an influence on these factors. The polling process cannot eliminate biases, but can at least contribute to greater awareness of their existence.

On balance, we believe that long-term energy projections are essential for both the public and private sectors of the world's economies. Rational decisions cannot be based on scenarios that fail the test of logical consistency. Individual projections will continue to differ, but it is worthwhile to attempt to understand why.

POSTSCRIPT ON THE DELPHI TECHNIQUE

The Delphi technique and the IEW process have elements in common, but there are distinct differences. Both entail iterative polling, which may lead to "cuing" and to an artificial consensus. And there may be unconscious biases in the selection of poll participants.

There are, however, the following key differences:

1. The IEW poll does not ask respondents for their personal opinions, but rather for their organization's most recent set of published projections. Written documents provide a more objective record than informal opinions and thereby make a systematic difference in the results.
2. Each respondent is asked to fill in a supplementary questionnaire that is designed to elicit information on the method of projection, reasons for differences from poll medians, and critical uncertainties in the international energy outlook. Again, this enhances the reproducibility of poll results.
3. Except for a few cases where anonymity is essential (e.g., as a consequence of US antitrust laws), the individual poll respondents are identified.
4. Face-to-face meetings are an essential part of the IEW process.

Workshop sessions are more expensive than remote polling, but these meetings appear far more effective in identifying the reasons for differences in projections. On international energy issues, it is just as important to understand these differences as to arrive at a logically consistent consensus. And we cannot expect any certainty other than the inevitability of surprise.

APPENDIX TABLES

A-1. IEW poll form, IIASA, 1983
A-2. IEW poll respondents

Other appendix tables, frequency distributions of region-by-region energy-GNP ratios, identification of individual countries/regions, individual response forms, and frequency distributions of responses are available in the form of a computer printout (approximately 600 pages) and a magnetic tape. For further information, please write to Leo Schrattenholzer at IIASA. Frequency distributions are also available for individual countries/regions.

Table A-1. International Energy Workshop Poll, IIASA, 1983

Country/Region: ______________________________

Organization/project: ______________________________

Reference (including date) of most recent report: ______________

	1980	*1990*	*2000*	*2010*
Index numbers, constant purchasing power; 1980 = 100:				
1. International price of crude oil (e.g. Arabian Light)	100			
2. Real GNP (or GDP)	100			
Primary energy, million tons of oil equivalent (mtoe)[a]				
3. Total consumption				
4. Total production				
5. Oil, consumption[b]				
6. Oil, production[b]				
7. Oil, exports—imports[b]				
8. Natural gas, consumption				
9. Natural gas, production				
10. Natural gas, exports—imports				
11. Coal, consumption[c]				
12. Coal, production[c]				
13. Coal, exports—imports[c]				
14. Hydroelectric and geothermal				
15. Nuclear energy				
16. Solar and other renewables				
17. Electricity generation (tkWh)				

[a]Useful approximations: 1 mtoe/year = 10^{13} kilocalories
0.65 mtoe/year = 1 million tons coal/year
50 mtoe/year = 1 million barrels daily
23 mtoe/year = 1 quad BTU/year

[b]Oil includes natural gas liquids, unconventional oils, and synthetics based on tar sands and shale oil.

[c]Coal includes solid fuels such as lignite and peat. Includes coal consumed for manufacture of synthetic fuels.

Table A-2. IEW Poll Respondents

Organization/project		Last Year Reported	Country/Region Coverage
ASSU	Academy of Sciences of the USSR, June 1983	2010	USSR
ATW	Forschungsgesellschaft für alternative Technologien und Wirtschaftsanalysen (ATW), University of Regensburg, October 1982	1990	Brazil, India, Kenya, Malaysia
BNL	Brookhaven National Laboratory, 1983 (forthcoming)	2010	U.S.A.
BPH, BPL	British Petroleum—high- and low-growth cases, December 1982	2000	4–7; OECD Europe
BPPTK	Badan Pengkajian dan Penerapan Teknologi (BPP Teknologi), December 1980	2010	Indonesia
CAL	Standard Oil Company of California, June 1982	2000	4
CANDD	CANDIDE Model, Economic Council of Canada, September 1982	1990	Canada
CECCP, CECEU CECFC, CEC, CECCT	Commission of the European Communities—Cooperation, Europe, and Free Competition scenarios, and results identical for all 3 scenarios, June 1983; Candidate Technologies scenario, March 1982	2000	Belgium, Denmark, Federal Republic of Germany, France, Greece, Ireland, Italy, Luxembourg, The Netherlands, United Kingdom
CERG	Cambridge Energy Research Group (UK), R. J. Eden,	2010	4–7; U.S.A. and Canada; Japan, Australia and New Zealand; Western Europe
CIES, CIESH, CIESL	Center for International Energy Studies, Erasmus University—OECD Europe, high-, and low-growth estimates, August 1982	2010	8; OECD Europe
CON	Conoco, January 1983	2000	4, 7; U.S.A.
CPC	Chinese Petroleum Corporation, February 1982	2000	Taiwan
CRIEP	Central Research Institute of Electric Power Industry, 1982	2010	Japan
CZMOE	Czechoslovakian Federal Ministry of Fuel and Energy, 1983	2000	Czechoslovakia
DNMOE	Danish Ministry of Energy, 1983	2000	Denmark
DOE82	U.S. Department of Energy, Office of Policy, Planning, and Analysis, and Analysis, July 1982	2000	5, 7
DOE	U.S. Department of Energy, Office of Policy, Planning, and Analysis, July 1983	2010	3, 4, 6; U.S.A.

Table A-2. IEW Poll Respondents (Continued)

Organization/project		*Last Year Reported*	*Country/Region Coverage*
DRIE	DRI Europe, March 1983	2000	Western Europe
ECE	U.N. Economic Commission for Europe, General Energy Unit and Projections and Programming Division, 1982	1990	USSR; Western Europe, Eastern Europe, North America, Total of ECE Regions
EEF	U.N. Economic Commission for Europe, General Energy Unit, "An Efficient Energy Future," March 1983	2000	1; U.S.A
EIA	U.S. Energy Information Administration, 1990 Midprice Scenario, 1983	1990	4, 5, 7; U.S.A.; Non-U.S.OECD, Developing Countries
EMCH	ETA–MACRO: China; A.S. Manne, Stanford University November 1982	2000	2
EMCN	ETA–: Canada; J.S. Rogers and T.F. Wilson, University of Toronto, May 1983	2000	Canada
ENI	Ente Nazionale Idrocarburi (ENI), 1983	1990	4
ESC	Energy Study Centre, January 1983	2000	The Netherlands
ETSHD, ETSLD	Energy Technology Systems Analysis Project of the International Energy Agency—High- and low-demand cases, 1983 (forthcoming).	2010	Australia, Austria, Belgium, Federal Republic of Germany, Ireland, Italy, Japan, The Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom, United States; Sum of the above 14 countries
EWRSI	The East–West Center, Resource Systems Institute, Energy and Industrialization Project, 1982	2000	Bangladesh, India, Pakistan, Papua New Guinea, Philippines, Singapore, South Korea, Sri Lanka, Thailand
FSZ	J.D. Fuller, S.D. Schwartz, and W.T. Ziemba, University of British Columbia, Fall 1982	2010	Canada
GRI	Gas Research Institute, September 1983	2000	U.S.A.

Table A-2. IEW Poll Respondents (Continued)

Organization/project		Last Year Reported	Country/Region Coverage
GULFB, GULFS, GULFL	Gulf Oil Corporation, Economics Division—Baseline, Supply Disruption and Low Economic Growth scenarios, February 1983	2000	4–7; U.S.A., Canada, Japan; Western Europe, Developing Countries
HNPB	Hungarian National Planning Board—Energy Modeling Group, 1983	2010	Hungary
IAEAH, IAEAL	International Atomic Energy Agency—high- and low-consumption estimates, September 1982	2000	1, 4, 8; OECD North America, OECD Europe, OECD Pacific, Asia, Latin America, Africa and Middle East; Industrialized Countries; Developing Countries
IEA, IEAHD, IEALD	International Energy Agency—Midpoints, high- and low-demand scenarios, October 1982	2000	4–6; USSR
IEA83	International Energy Agency—Low-demand scenario, June 1983	2000	4
IEE	Institute of Energy Economics, Japan, December 1982	1990	Japan
IEMF	Israel Energy Modeling Forum, July 1982	2010	Israel
IFT	Institute for Future Technology, 1982	2010	Japan
IIASA, IIA83	International Institute for Applied Systems Analysis, 1981; also 1983	2010	1–4, 7–8; Aggregate of IIASA regions 4 and 5, IIASA region 6
IND	Standard Oil Company of Indiana, May 1983	2000	1–8; Aggregate of Israel, Yugoslavia, and South Africa
INET	Institute of Nuclear Energy Technology, Quinghua University, Beijing, December 1981	2000	2
IPE	IPE Model; N. Choucri, Massachusetts Institute of Technology, 1982	2000	4–7; U.S.A. Japan; Western Europe
JAERI	Japan Atomic Energy Research Institute, March 1983	2010	Japan
LEOB	J.J. Schmidt, University of Mining and Metallurgy, Leoben, 1983	2010	8
LOVNS	A. and H. Lovins, Rocky Mountain Institute, June 1982	2000	8

Table A-2. IEW Poll Respondents (Continued)

Organization/project		*Last Year Reported*	*Country/Region Coverage*
MERZ	N. Merzagora, Economic Analysis Division, ENEA, June 1983	2000	Italy
MKR	S.K. Mukherjee and S.H. Rahman, November 1982	2000	India
NGODP	International Natural Gas Study, Harvard University, and the OPEC Downstream Project, East–West Center, B. Mossavar-Rahmani and F. Fesharaki, 1983	1990	5; Algeria, Ecuador, Gabon, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates, Venezuela
NRMPE	Norwegian Royal Ministry of Petroleum and Energy, 1982	1990	Norway
NZMOE	New Zealand Ministry of Energy, August 1982	2010	New Zealand
OBENA, OBENB	Observatoire de L'Energie—Scenarios A and B, January 1983	2000	France
OEWAG	Österreichische Elektrizitätswirtshafts-AG (Austrian Electric Company), 1982	2000	Austria
OLADA, OLADB	Organización Latinoamericana de Energía (OLADE)—Scenarios A and B, 1983	2000	Latin America
OPECD, OPECL	Organization of Petroleum Exporting Countries (OPEC)—Domestic Energy Requirements and Long-Term Energy Models, 1983 (forthcoming).	2010	4–7
ORIEA	Oak Ridge Institute for Energy Analysis, 1982	2000	1–8
PAEC	Pakistan Atomic Energy Commission, December 1982	2010	Pakistan
PAR	J. Parikh, International Institute for Applied Systems Analysis, 1982	2010	India
PIEEM	Potential for Industrial Expansion Energy Model; Energy Studies Unit, University of Strathclyde, Scotland, October 1982	2010	8
PILOT	PILOT Energy-Economic Model; P. H. McAllister and J. C. Stone, Stanford University, December 1982	2010	U.S.A.
POLAS	Energy Problems Committee, Polish Academy of Sciences, July 1982	2010	Poland

Table A-2. IEW Poll Respondents (Continued)

Organization/project		*Last Year Reported*	*Country/Region Coverage*
RESPA	Respondent A, January 1983	2000	3–7
RESPB	Respondent B, January 1983	2000	3–7
RESPC	Respondent C, 1982	1990	4–7
RESPH	Respondent H, 1983	2000	Japan
RESPI	Respondent I, 1983	2000	7; U.S.A. Japan; Developing Countries, Western Europe
SERI	Solar Energy Research institute—Lawrence Berkeley Laboratory, 1981	2000	U.S.A.
SHELL	Shell International, London, June 1983	2000	7
SMIE1, SMIE2	Spanish Ministry of Industry and Energy (MINER)—Scenarios 1 and 2, 1983	2000	1, 2, 8; Japan; Western Europe, U.S.A. and Canada, Latin America, Africa, Middle East, Aggregate of South Asia, Southeast Asia, and Australasia
SMIL	V. Smil, University of Manitoba, 1983	2010	2, 8
SOHN	I. Sohn, New York University, December 1982	2000	1–8
STOHS, STOLS	R. Stobaugh—high- and low-energy supply cases, May 1982	2000	4–6
SWEA	Swedish Energy Agency, June 1983	2000	4
TEA	J. Brady, National Board for Science and Technology, Ireland, April/May 1983	2010	Ireland
TRAC1, TRAC2, TRAC3	Tractionel–Scenarios 1, 2, and 3, July 1982	1995	Belgium
UNIDO	United Nations Industrial Development Organization (UNIDO), February 1983	1990	2; Japan; North America, Western Europe, Eastern Europe, Latin America
WBK	World Bank, July 1982	2000	1–8
WECHG, WECLG	World Energy Conference (WEC)—Preliminary projections, 1983 (forthcoming)	2000	3, 7, 8; Developing Countries (5 + 6)
3RT	3RT Model; A.S. Manne and P.V. Preckel, Stanford University, March 1983	2000	4–7