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INTERNATIONAL ENERGY WORKSHOP: A PROGRESS REPORT

Alan S. Manne
Stanford University
Palo Alto, California, USA

Leo Schrattenholzer
International Institute for Applied Systems Analysis
Laxenburg, Austria

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FOREWORD

The International Energy Workshop (IEW) is a network of analysts concerned with international energy issues. Its aims are to compare long-term energy projections and to understand the reasons for diverging views. The IEW conducts iterative polling on key energy issues and publishes the results of these polls semi-annually. The pool results are discussed in annual meetings, alternating between Europe and North America. Participation in the IEW is informal and is open to anyone supporting the aims of the Workshop.

This report by Professor Manne of Stanford University and Dr. Schrattenholzer of IIASA describes the status and progress of the IEW in mid-1985. It served as background for the meeting held at IIASA in June 1985.

T.H. LEE
Director
International Institute for Applied Systems Analysis

International Energy Workshop: a progress report

Prof Alan S. Manne and Dr Leo Schrattenholzer

THIS PAPER REVIEWS the activities of the International Energy Workshop (IEW) during the years 1984–85. Our report is focused upon the international oil price. We present frequency distributions of oil price projections made at different times. These lead to two major observations. First, the range of projections is wide, eliminating the hope that there might be at least a near-consensus among experts about the oil price developments. Secondly, the trend (median) of the oil price projections reflects the movement of current prices. The median projection of oil prices in the year 2000 has dropped by almost 40 per cent between 1981 and 1985. This mirrors the trend in current prices between these years.

These two observations are consistent with a "random walk" model of oil prices. This model – like any other model – makes simplifying assumptions, but it exhibits an important feature, i.e. it produces a range of outcomes rather than a single value. The model thus emphasizes the uncertainty of projections into the future. Moreover, it clearly shows that the range of uncertainty widens as one looks further ahead. Basing this model upon the actual annual changes in the international oil price between 1970 and 1984 (and eliminating the biggest change as a statistical "outlier"), a range larger than 1:3 is needed to include the oil price in the year 2000 with a probability of two-thirds. This means that the results of the random walk model suggest an even greater range of uncertainty than is indicated by the IEW poll itself.

Thus, the main result of the IEW is not a "best forecast" but a quantification of the range of uncertainty of the oil price projections. This means that the oil price of the more distant future cannot be assumed as a variable that can be calculated with reasonable precision. In decision-making, it is therefore risky to use any single number for the future oil price when attempting to quantify the consequences of decision alternatives. It seems much more reasonable to check decisions with a large number of possibilities and to hedge against both upside and downside risks.

In the remainder of our paper, we summarize the poll results with respect to energy quantities supplied and demanded: primary energy consumption; and oil and gas production, consumption and international trade.

The authors are members of the International Institute for Applied Systems Analysis at Laxenburg, Austria. *They are grateful to Alexander Svoronos for his assistance in the preparation of this paper.*

The results are reported from two special surveys. One deals with the role of modelling methods for projecting international oil prices and the other with demand elasticities.

1. The activities of the International Energy Workshop

The International Energy Workshop provides a network for communication between analysts concerned with long-term international energy issues. It conducts iterative polling, compares alternative projections, and attempts to understand the reasons for diverging views. The poll results began to appear in 1981 and are now published semi-annually. They are discussed in annual meetings, alternating between Europe and North America. Participation in the IEW is informal and is open to anyone supporting the aims of the Workshop.

The poll covers only those items that are comparable in existing international energy statistics: crude oil prices, GNP growth, primary energy consumption, production and trade, and electricity generation. Typically, the respondents provide a "surprise-free" reference case. In addition, there may be alternative scenarios related, for example, to different economic growth rates.

No explicit probability estimates are assigned to the individual projections. Each reader is left to draw his own conclusions as to their plausibility. Some of the responses are generated by formal models and some by informal methods. All that is required is that an individual response constitute a logically consistent scenario for a given country or region.

The results are grouped geographically according to a standardized list of eight major regions, plus five individual countries/regions for which there are five or more poll responses. In addition, there is a geographical category labelled NEC, not classified elsewhere. **Table 1** summarizes the regional distribution of the responses included in the January 1985 edition of the poll. Altogether, there were 345 individual responses from 75 participants. On average, each participant provided five responses covering alternative scenarios and/or regions.

Thanks to the United Nations Statistical Office, the quality of the IEW data base has been greatly improved. We are now in a position to compare UN energy statistics (for 1970–1982) with the poll medians for 1980, 1990, 2000 and 2010. Unlike earlier editions of the poll, there is only one area – the international oil trade – in which there are major inconsistencies in the 1980 base year statistics. If the UN energy statistics are taken literally, the world has become a net importer of crude oil and there has been a growing trend in this direction since 1975! Some of these difficulties represent definitional problems (bunkers, products versus crude oil, etc), but others are apparently associated with national secrecy concerning the oil trade.

Table 1
Regional distribution of responses

	No. of responses
1. SU/EE (Soviet Union and Eastern Europe)	10
2. CH/AP (China and other Asian planned economies)	10
3. CPE (Centrally planned economies), sub-total	15
4. OECD	29
5. OPEC	21
6. NODC (Non-OPEC developing countries)	16
7. MKT (Market economies), sub-total	32
8. WORLD, total	22
9. Individual countries/regions	
Canada	5
Japan	11
Latin America	8
OECD Europe	14
US	23
NEC (Not elsewhere classified)	129
Total	**345**

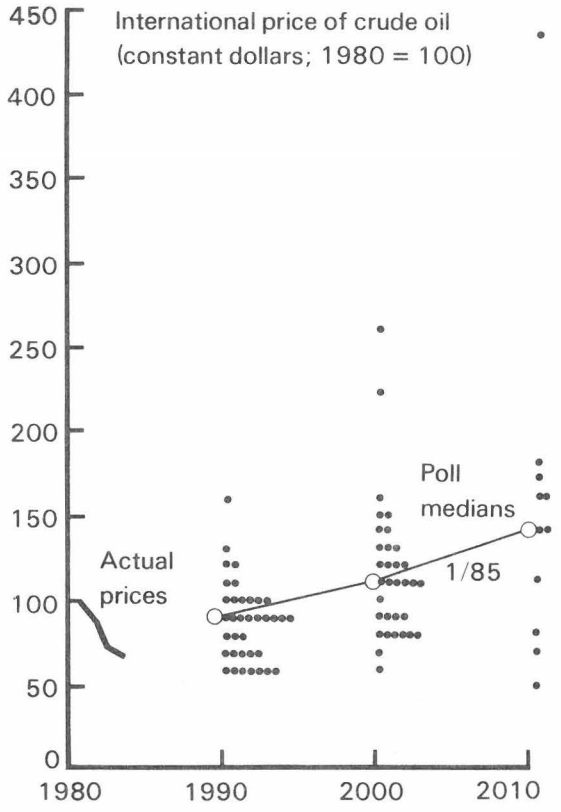
The IEW is in its fifth year. It has become possible to make comparisons not only between contemporary projections, but also between those made at different times. When making these comparisons, however, it must be recognized that the group of individual respondents has not remained constant from one survey to the next and that this change of the underlying sample could explain part of the observed change.

The 1985 edition of the IEW poll contains only those responses bearing publication dates of 1983 or later. It is essential to standardize for the date of publication if we are to obtain a better understanding of the wide range of views among different groups making long-term projections of international crude oil prices.

2. International oil prices

Figure 1 contains a frequency distribution of international crude oil price projections – taking only a portion of the responses appearing in the 1985 poll – those bearing publication dates of 1984–85. Individual respondents/scenarios are identified by a 3–5 character code. These codes, together with the individual poll responses, are recorded in a publication that is available upon request.

Figure 1
International price of crude oil, responses dated 1984–85



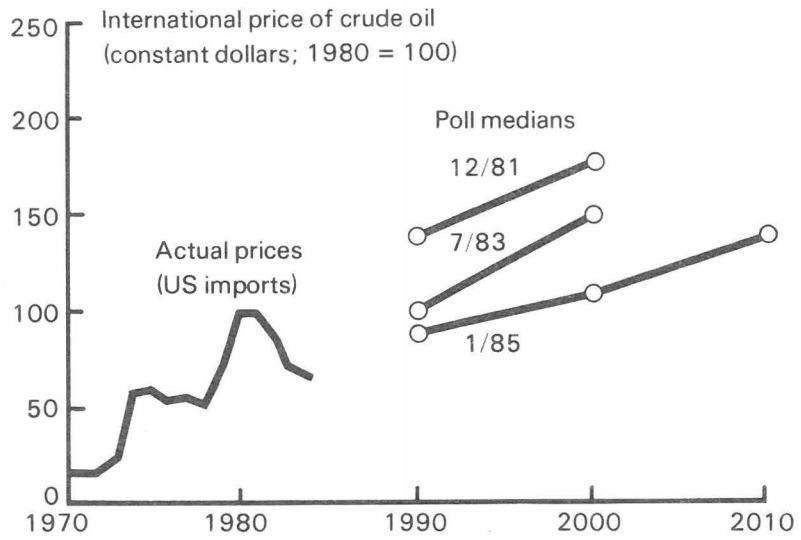
1980		1990		2000		2010	
Medians:	100.000		89.500		109.000		141.000
AGABD	100 000	REGLD	163 000	REGLD	265 000	REGLD	432 000
AGAHD	100 000	IPE	125 300	BLNCE	218 000	REGBD	181 000
AGALD	100 000	REGBD	122 000	PILOT	162 000	CHVRN	166 500
BLNCE	100 000	BLNCE	121 000	SAUNS	153 000	DOE	164 500
BP	100 000	ESCN	106 000	REGBD	149 000	ETAMC	164 500
CERG	100 000	WBK	106 000	RESPP	144 000	IIAGS	141 000
CHVRN	100 000	CPON	105 000	CPON	140 000	CERG	140 000
CIESH	100 000	ROL	105 000	AGALD	132 000	DRI	106 000
CIESL	100 000	AGABD	100 000	ESCN	130 000	REGHD	82 000
CPON	100 000	AGALD	100 000	IPE	129 200	CIESL	70 000
DOE	100 000	IIAGS	100 000	AGABD	122 000	CIESH	55 000
DRI	100 000	SWEA	98 000	IIAGS	122 000		
DRIE	100 000	SAUNS	94 000	CERG	120 000		
EIA	100 000	PILOT	92 200	ROL	120 000		
ESCN	100 000	RESPK	91 000	CHVRN	113 800		
ETAMC	100 000	EIA	90 000	HNPO	110 000		
HNPO	100 000	HNPO	90 000	DRIE	109 000		
IEA	100 000	REGHD	90 000	RESPJ	106 000		
IIAGS	100 000	AGAHD	89 000	DOE	105 500		
IPE	100 000	DRIE	89 000	ETAMC	105 500		
NEB	100 000	CIESL	87 500	RESPK	97 000		
NRMPE	100 000	RESPM	81 000	RESPM	95 000		
PILOT	100 000	CERG	80 000	DRI	92 000		
REGBD	100 000	RESPP	78 000	AGAHD	89 000		
REGHD	100 000	CHVRN	74 900	NEB	86 000		
REGLD	100 000	RESPJ	73 000	RESPL	83 000		
RESPJ	100 000	CIESH	72 500	BP	82 200		
RESPK	100 000	NEB	72 000	NRMPE	82 000		
RESPL	100 000	RESPL	70 000	REGHD	82 000		
RESPM	100 000	NRMPE	65 000	IEA	79 000		
RESPP	100 000	DOE	64 800	ROWSE	78 000		
ROL	100 000	ETAMC	64 800	CIESL	75 000		
ROWSE	100 000	DRI	64 000	CIESH	65 000		
SAUNS	100 000	ROWSE	64 000				
SWEA	100 000	BP	62 500				
WBK	100 000	IEA	58 500				

Oil prices are shown here as index numbers, expressed in currency units of constant purchasing power with 1980 = 100. To convert to 1984 dollars per barrel, multiply by 0.42. Thus, the 1984 index value = 67 (equivalent to $28/barrel). A solid line connects the median projection for 1990 with those for 2000 and 2010. According to the conventional wisdom (the poll medians), the oil glut of the mid-1980s will disappear by 1990. OPEC will then increase its market share and prices will begin a sustained climb to 2000 and beyond.

Space limitations do not permit us to provide detailed comments on each of the individual projections. It should be noted, however, that the highest price scenario (REGLD) was not the outcome of an independent model of the world oil market. Rather, it was designed to generate a low demand scenario for a single country, Sweden.

Figure 2 puts the median oil price projections into some perspective. First, they are compared with the historical data on the refiners' acquisition costs of crude oil imported into the US, adjusted by the US GNP deflator (see Energy Information Administration, 1984). If the series were based on currency units other than US dollars – or if it were based upon other grades or locations of crude oil – the precise amounts of change would differ, but

Figure 2
Comparison of poll medians, 1981–1983



there would still be the same general appearance – the two price jumps of 1973–74 and 1979–80 followed by several years of downward drift.

Figure 2 also compares the 1/85 medians with those made at two previous dates: 12/81 and 7/83. The median projection of the oil price in the year 2000 has dropped by almost 40 per cent between 1981 and 1985. This is almost the same as the 33 per cent decline in the real price of crude oil (measured in US dollars) during the same period. Both of these median projections imply a three per cent annual increase in the real oil price between the date of the forecast and the year 2000. These results cannot be explained away simply by differences in the group of respondents from one date to the next.

Like so many other comparisons of energy forecasts, this one has the appearance of a downward-folding fan. For a given date, each successive price path is lower than its predecessor. Yergin et al (1984) describe this phenomenon by saying that "Today's Vintage V (price forecast) is, like those preceding it, overwhelmingly shaped by the projection of current circumstances into the future".

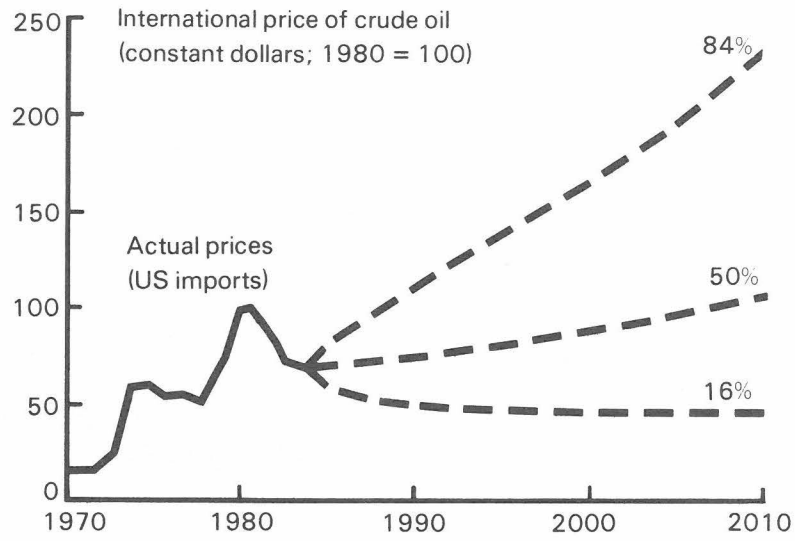
In more technical terms, this may be described as "adaptive expectations". That is, each new projection begins with the then-current oil price. Past trends are extrapolated linearly (or exponentially) from that point – with or without independent cross-checks.

These ideas may be formalized through a stochastic process known as a random walk model. It is supposed that each year's percentage price changes are independent of those that occurred the previous year. When accumulated over time, the total change approaches a log-normal probability distribution. This has an important practical result. The range of uncertainty widens with the distance into the future.

In **figure 3** (reproduced from Manne, 1985), the "drift" and variance parameters have been based upon the history of international oil prices through 1984. On this basis, there is an 84 per cent probability that future oil prices will lie below the upper dotted line, and a 16 per cent probability that they will lie below the lower one.

The random walk model suggests an even greater uncertainty of outcomes than is indicated by the IEW poll itself. Although this conclusion is based upon a simple model, it appears robust enough to suggest that there is little hope for high precision with respect to long-term price forecasts. Price movements are essential for equilibrating supplies and demands, and it would be desirable to have more precise long-term forecasts. From the viewpoint of a prudent decision-maker, however, all that can be done is to be aware of the range of uncertainty and to hedge against both upside and downside risks.

Figure 3
Results of the random walk model



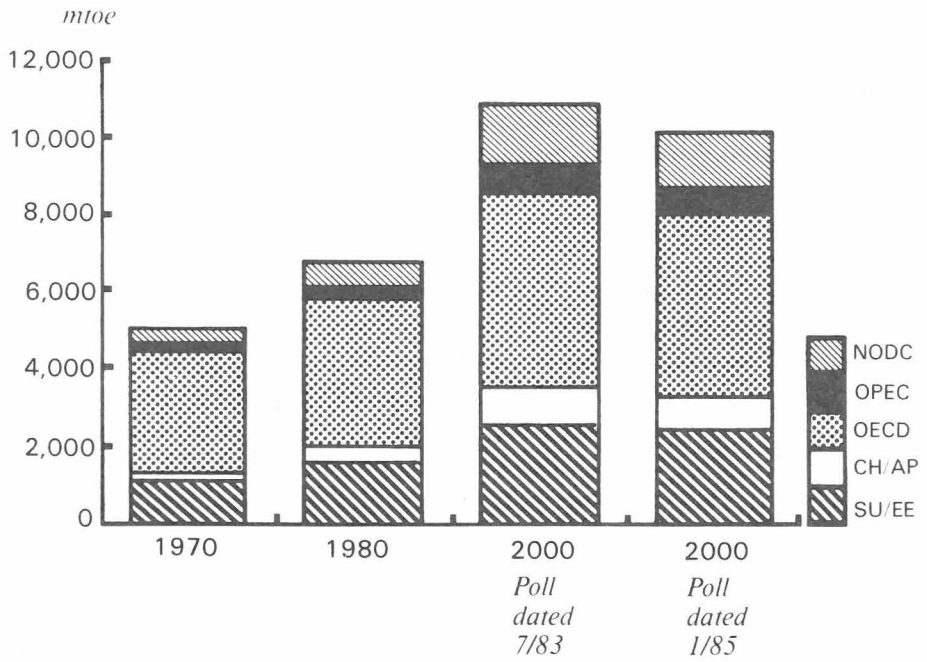
3. Primary energy consumption and conservation

Figure 4 provides an overview of total primary energy consumption. In 1980, the industrialized countries (the USSR/Eastern Europe together with the OECD) had only 27 per cent of the world's population, but consumed 80 per cent of the commercial primary energy. This is much the same pattern as prevailed in 1970 and — according to the poll medians — this is likely to persist through 2000. The developing countries have rapidly growing populations, but will be unable to afford the cost of large increases in energy consumption during the next two decades.

Energy quantities are less volatile than prices. In percentage terms, there are only minor differences between the 7/83 and the 1/85 median projections of GNP growth and total energy consumption for the year 2000. The decrease in consumption (between the 1983 and 1985 polls) is almost entirely due to a decline in the projection for nuclear energy. The overall change reflects the worsening outlook for this specific sector, and cannot be explained by changes in the composition of the IEW poll.

Although the developing countries (OPEC and NODC) will not become major energy consumers in absolute terms, their demands are likely to grow rapidly in relation to past levels. **Figure 5** provides a regional distribution

Figure 4
Total primary energy consumption

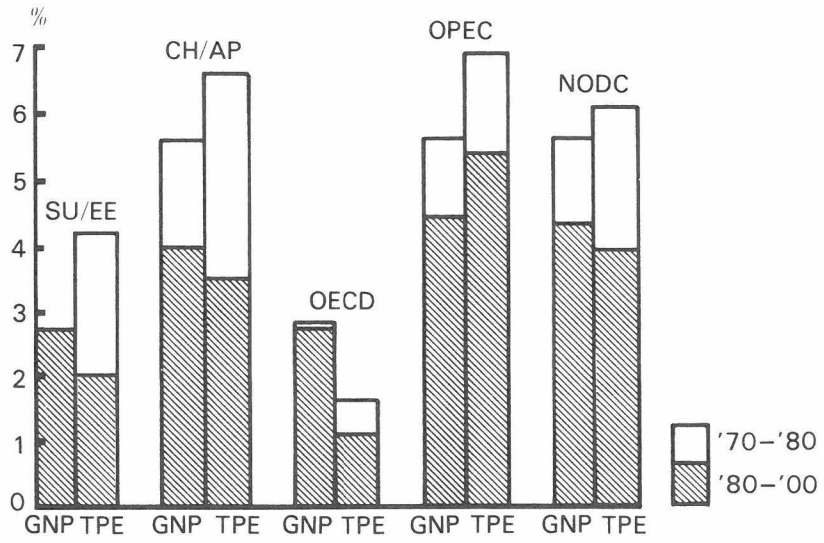


of annual growth rates realized during the period 1970−80 and compares these with the median growth rates for 1980−2000.

According to figure 5, the energy consumption of OECD nations will continue to grow at a slower rate than GNP. In part, this may result from a shift away from exports of energy-intensive products. Outside the OECD region, the median view is that energy consumption will grow at almost the same rate as GNP. In the OPEC nations, this may represent a shift towards export-oriented industries such as petrochemicals based upon domestic natural gas.

For the non-OPEC developing nations, there is a near-constancy of the energy-GNP ratio. This needs further examination. Because of the changing mix between agriculture, manufacturing and services, there may be few opportunities for energy conservation in this region. But there is an alternative view − that the prospects for conservation have not been studied as intensively in the developing nations as in the OECD region. On the demand side, this is virtually the same issue that Odell (1983) has raised with respect to the supply of oil. That is, the developing countries have not yet made a

Figure 5
Annual growth rates of GNP and total primary energy (TPE) consumption relative to past levels



Note: This figure provides a regional distribution of annual growth rates realized during the period 1970–80, and compares these with the median growth rates for 1980–2000.

thorough exploration of their options either for oil production or for energy conservation.

For a detailed breakdown of primary energy consumption by fuel, see **table 2**. This table includes the contributions from each of the primary sources of energy: oil, gas, coal, nuclear and renewables. The category of "renewables" combines conventional hydro-electric and geothermal along with solar and other renewables. We continue to obtain erratic responses to poll item 16 (solar and other renewables). There are no uniform accounting conventions in this area. At the global level, the 11 individual responses for the year 2000 covered a range from 2 to 2,110 million tons of oil equivalent (mtoe)!

For the year 2000, table 2 includes a category termed "conservation". This is defined as the difference between the amounts of primary energy from the physical sources of supply – and the amount that would have been

Table 2
Median IEW poll responses on primary energy consumption

mtoe

	(2) GNP	(3) TPE	(5) Oil	(8) Gas	(11) Coal	(15) Nuclear	(14–16) Renewables	"Conservation"
SU/EE								
1980	100	1,567	538	382	588	20	58	–
1990	137	2,015	559	603	684	87	94	132
2000	171	2,348	554	716	752	134	143	332
CH/AP								
1980	100	452	93	13	325	0	21	–
1990	157	618	107	16	456	1	150	92
2000	219	895	158	30	632	7	272	95
OECD								
1980	100	3,790	1,855	743	770	138	278	–
1990	128	4,060	1,690	792	940	358	339	790
2000	172	4,730	1,703	866	1,360	525	424	1,790
OPEC								
1980	100	200	130	59	1	0	8	–
1990	155	331	215	96	9	0	13	–21
2000	236	574	319	166	18	3	24	–102
NODC								
1980	100	739	408	58	157	4	90	–
1990	148	1,078	515	103	263	29	165	16
2000	232	1,588	691	183	373	50	290	126
World								
1980	100	6,745	3,000	1,255	1,805	165	473	–
1990	132	7,978	3,040	1,620	2,341	417	675	925
2000	178	9,855	3,314	1,915	3,025	685	1,005	2,151

Notes: *(1) GNP (or GDP) is measured as an index number with 1980 = 100. All other items are measured in million tons of oil equivalent.*
(2) The poll medians for individual fuels do not necessarily add up to TPE (total primary energy). Moreover, the medians for individual regions do not necessarily add up to the world totals. These estimates are constructed independently of each other, but are in reasonably close agreement.
(3) In the case of poll item 16 (solar and other renewables), there are wide variations in definitions from one organization to another. Some groups include non-commercial energy in this category and others do not. Because a number of respondents have combined solar and other renewables with poll item 14 (hydro-electric and geothermal), we have also done so here. Poll item 16 (when reported) has been subtracted from total primary energy consumption and production. This adjustment provides for closer comparability with the statistical concept of commercial energy.

consumed if the energy-GNP ratio had remained constant since 1980. This is not an independent analytical concept, but it provides a convenient shorthand way to describe a variety of forces: government directives, price-induced substitution, demand saturation and structural changes in the pattern of GNP growth.

For the OECD nations, table 2 indicates that conservation is likely to contribute more in the way of new energy than the combined total of all the conventional sources of supply. It is unclear whether this outcome is based upon a careful sector-by-sector analysis, or whether it represents a trend extrapolation from the 1970–80 decade with its two oil price adjustments.

4. Oil and gas production and trade

At the regional level defined by the IEW, there is a negligible amount of international trade in coal and electricity. Since oil and gas are the principal commodities that move in international trade, we shall focus only on these two items.

Figure 6 presents the poll medians of the global outlook for oil consumption, production and trade. According to most respondents, there will be only minor increases from the 1980 level of production for the world as a whole. This view is hotly disputed by a number of Workshop participants. They hold that leasing and taxation issues have led the oil industry to systematically understate the geological prospects. On this basis, they estimate that the world's ultimately recoverable conventional resources may be 3–6 trillion barrels rather than 2 trillion barrels (today's conventional wisdom). If the minority view is correct, the world's oil industry can continue to expand through 2000 and beyond. Given the range of views on oil production and consumption, it is no wonder that there are even wider ranges of opinion on how much will be exported by OPEC, the "swing" producer, throughout this period.

For a summary of the poll medians on natural gas, see **figure 7**. At a global level, gas production prospects appear brighter than those for oil. There is general agreement that the resource base in the USSR and in OPEC will permit production to continue to expand, but that expansion will not be possible for the OECD countries. Increases in OECD consumption will have to be matched by increases in imports from the gas-surplus regions.

5. Methods of projecting international oil prices

Among the IEW participants, some groups rely on formal models. Others employ expert judgement and scenario analysis. Each of these approaches has its pros and cons. Formal models may easily become divorced from practical realities. Expert judgements are inherently subjective, and

Figure 6
Oil consumption, production and trade

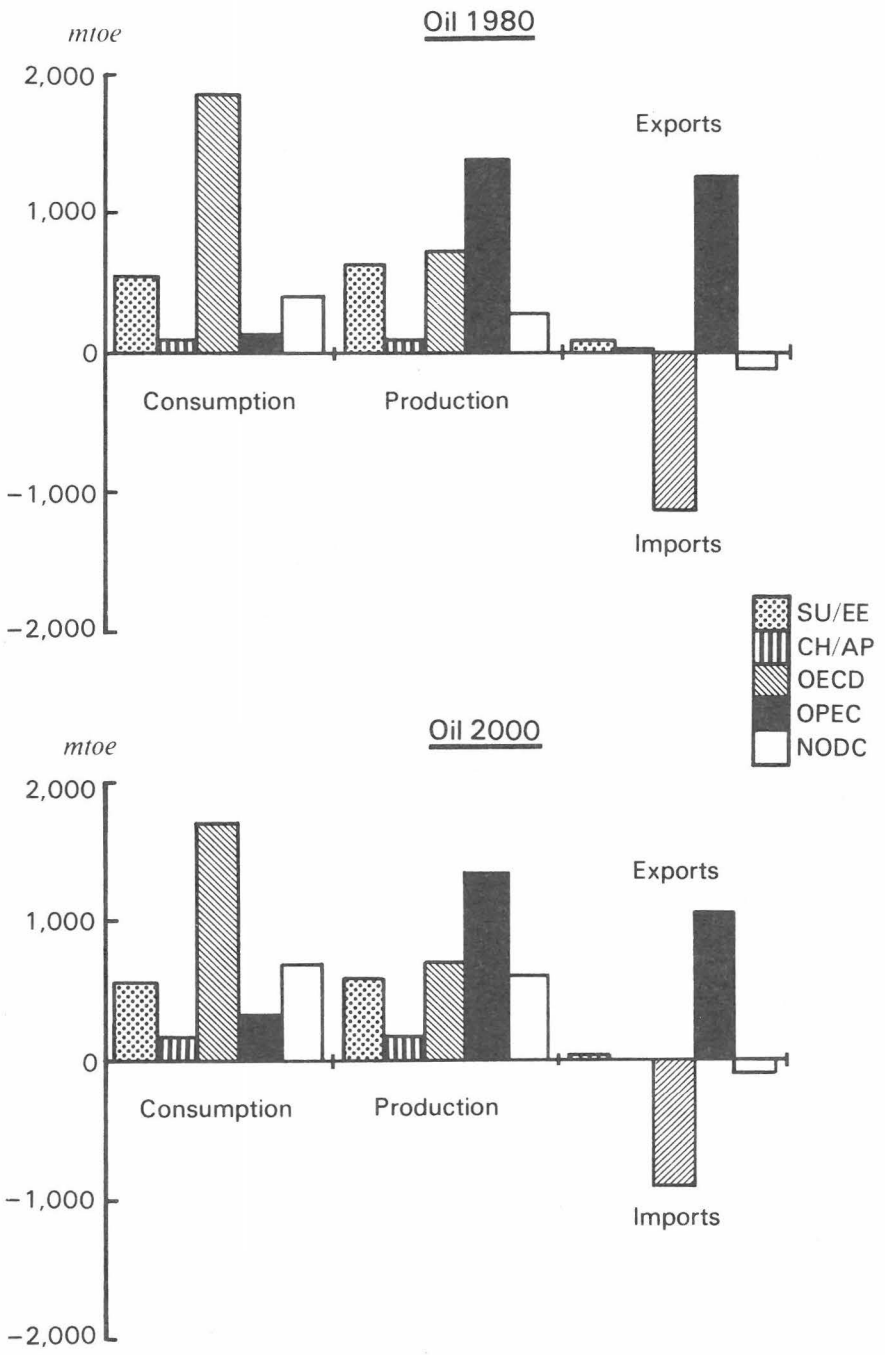
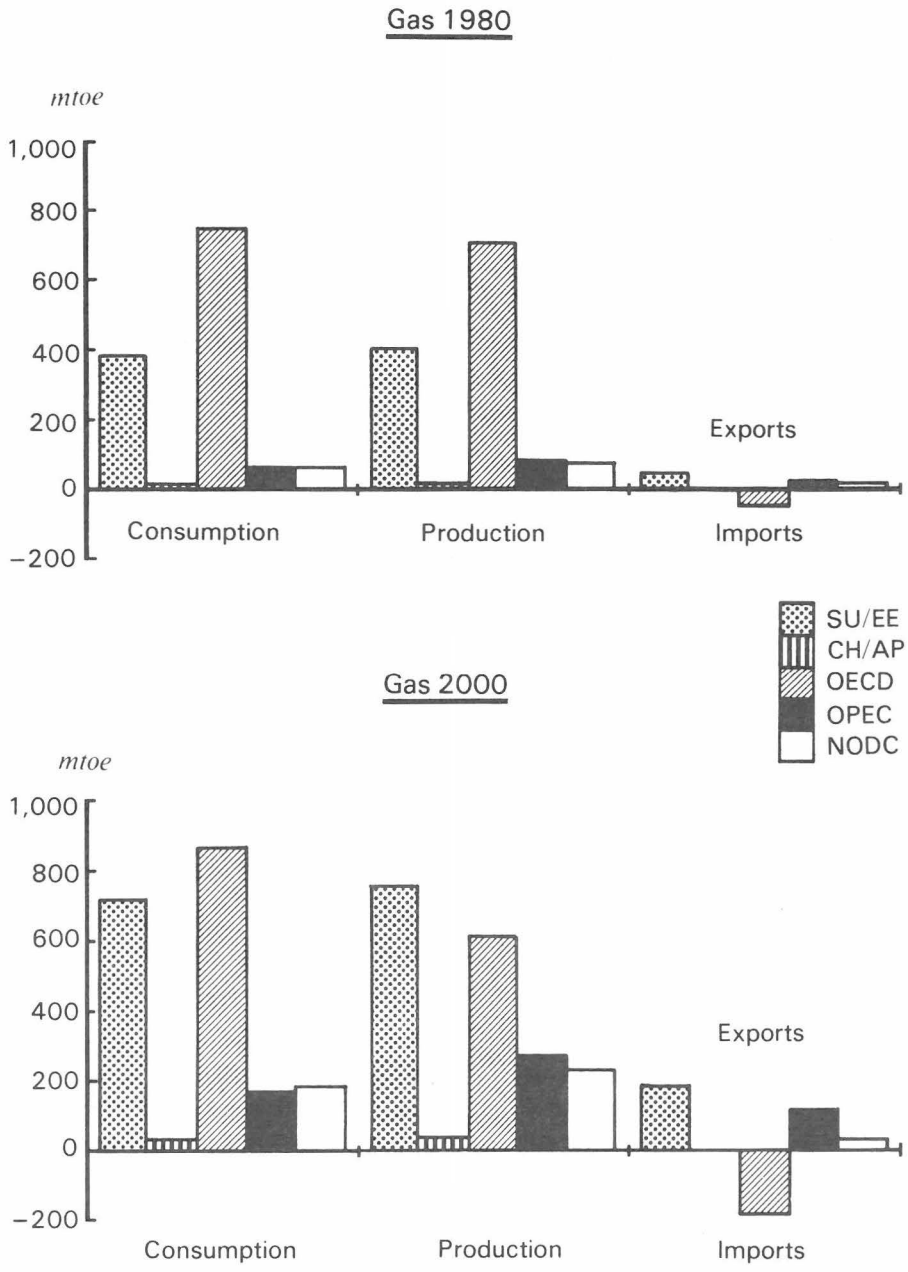


Figure 7
World regional gas consumption, production and trade



may be overly influenced by current events. From the individual IEW poll responses, there is no direct way to determine, for example, whether oil prices represent an input assumption based upon expert judgement, or whether they represent the independent output of a formal model in which prices serve to equilibrate supplies and demands. All that is known is that the prices and quantities together form a logically consistent picture.

In order to obtain a better understanding of the methods used by the poll respondents, we asked them to indicate how they arrived at the international oil prices associated with their projections. To date, specific information is available for only half of the poll participants. In **table 3**, these responses have been grouped into three categories: those that reported the use of a formal model of international oil prices at some point in the analytical process; those where the origin of the projected oil prices is somewhat ambiguous; and those that reported only the use of expert judgements. We are aware that this table is incomplete, and that it may contain inaccuracies. Corrections and additions will be welcomed.

Table 3
Analysis of the international oil market – use of a formal model

Yes	Ambiguous	No, expert judgement only
CIES	AGA	CPC
CON	BP	DRI
CPON	CRIE	DRIE
DOE	ERIEA	HNPO
EIA	ESCN	PIRNC
ETAMC	GNV	REG
GATLY	GRI	RESPM
GULF	IND	RESPP
IEA	RESPI	SHLL
IIASA	SWEA	
ISP	TATA	
RESPX	WBK	
SAUN	WEC	
SINGR		
TRT		
15	**13**	**9**

Table 3 suggests that only a minority of poll respondents base their projections upon formal models for the determination of international oil prices. Most rely upon informal methods. Even among those that do employ international oil models, it is clear that the results are cross-checked in other ways. In any case, the independence of the oil price projections is an important problem that deserves further investigation.

Because there are advantages in both formal and informal approaches, a combination of methods may be more reliable than any one by itself. The advantages of a combined approach have been documented empirically in short-term macro-economic and sales forecasting. See, for example, Makridakis and Winkler (1983). In these cases, there is evidence that a consensus forecast may have a lower average error than the individual analyses from which it is built up. The same principles may also apply to long-term projections of international oil prices and the quantities traded.

6. Demand elasticities survey

In the market economies, price changes provide an incentive for energy conservation. Accordingly, it seemed useful to conduct a separate poll on the values of the price and income elasticities of demand that are either explicit or implicit in the IEW poll responses. For this purpose, we concentrated on those in which the international price of oil is an output result rather than an input assumption.

The original poll responses do not enable us to determine whether oil prices are an input or an output. They do, however, provide one clue along these lines. Since oil prices are unlikely to be an output when the analysis is confined to a single country or to a small region of the world, it was supposed that oil prices might be an output of each of the two dozen responses that included both oil prices and the quantities consumed either for the OECD region or for the market economies as a whole. In February 1984, these groups were asked the following questions:

(a) In principle, would it be possible to make a controlled comparison, employing an oil price or a GNP growth different from your baseline projections?

(b) In practice, by July 1984, will it be possible for you to send in one or more IEW poll forms, making a controlled comparison (for the OECD region and/or for the market economies as a whole) covering the following scenarios?

> (i) Gradual productivity gains (or losses) leading to a GNP growth index (1980 = 100) that is 25 points lower (or higher) than your baseline response for the year 2000.

(ii) Gradual oil supply gains (or losses) leading to an oil price index (1980 = 100) that is 25 points lower (or higher) than your baseline response for the year 2000.

In effect, question (a) asks whether the projections are based upon a formal model that is currently operational. Question (b) is divided into two parts. From the response to part (i), one can infer GNP elasticities (holding oil prices constant). From part (ii), one can estimate the price elasticities (holding GNP constant). These questions appear straightforward, but in practice turned out to be somewhat ambiguous. It was not until late 1984 that we succeeded in obtaining nine usable responses. In retrospect, it was an error to have requested price and GNP variations in terms of index points rather than percentage changes. Accordingly, the quantity responses are not reported directly, but are converted into the elasticity estimates shown in **table 4**.

A number of poll participants declined to take part in this survey. Some were unable to do so because their analyses were based upon expert judgement/scenario methods rather than upon formal models. Controlled comparisons then become difficult or impossible. Others were unable to participate in the survey because of lack of time — or because their models were no longer operational. Among the groups that responded, one requested anonymity and is therefore labelled RESPX (respondent X). Another (EIA) was unable to report numerical results beyond 1995.

According to table 4, the consensus view is that the GNP elasticity of oil consumption is approximately 1.0, and that the intermediate-run price elasticity is 0.3. That is, a one per cent change in GNP will lead to a one per cent change in oil consumption — holding prices and other demand determinants constant; and a one per cent increase in crude oil prices will lead to a three per cent decline in consumption — holding GNP, etc, constant.

Among the GNP elasticities, the only significantly different value from unity is that of Singer (1983) — here abbreviated SINGR. His poll response is based on a case in which the total OECD demand for oil would grow at 1.5 per cent per year if prices remained constant. This may be interpreted in terms of a GNP elasticity of 0.6 and a GNP growth rate of 2.5 per cent per year. The low GNP elasticity goes a long way towards explaining why Singer's oil price projections are so much lower than others.

Because of one unanticipated difficulty, the price elasticities are labelled as intermediate, rather than long run. That is, the questionnaire asked the participants to run their models with gradual rather than sudden changes. A gradual change is more realistic in appearance, but is not as efficient for computing a long-run price elasticity. In several of these models, no

Table 4
Elasticities of oil demand

Respondent	Region	Oil price elasticity, intermediate run (absolute value)	GNP elasticity
CIES	OECD	0.54	1.00
CIES	MKT	0.31	1.00
CON	MKT	0.57	–
CON	MKT	0.44	–
CON	MKT	–	0.98
CON	MKT	–	1.02
EIA	MKT	0.28	–
GATLY	MKT	0.32	–
GATLY	MKT	0.30	–
GATLY	MKT	–	0.99
GATLY	MKT	–	0.98
GULF	MKT	0.17	1.00
IIASA	OECD	0.10	–
IIASA	OECD	–	0.86
RESPX	OECD	0.33	–
RESPX	MKT	0.26	–
SINGR	OECD	0.34	0.60
TRT6	OECD	0.29	1.00
TRT6	MKT	0.25	1.00

more than half of the full long-term response will have occurred by the year 2000. With the benefit of hindsight, this difficulty could have been avoided by asking respondents to complete the oil supply or the income changes by 1990 rather than 2000. Having failed to do this, the price elasticity estimates are described as intermediate run. Independent evidence suggests that the long-run price elasticities may have twice the values shown here.

For five of the nine respondents, the value of the intermediate-run price elasticity is approximately 0.3. These five estimates may not be altogether

independent. Three participated in the world oil study undertaken by the Energy Modelling Forum (1982). There, all the models were run under the general guideline that 0.6 was the long-run price elasticity of demand for crude oil. This was exactly the numerical value adopted for the OECD region in the scenario described here as TRT6 (Manne and Preckel). This was also the elasticity input assumption adopted by IEW respondent GATLY (Gately).

Among the price elasticities shown in table 4, the lowest value is 0.1 (reported by IIASA). This result can be traced directly to the methodology employed in the IIASA global energy studies. GNP growth and the MEDEE accounting framework together determine the demands for "useful" energy services. Accordingly, energy prices affect interfuel substitution, but not the level of useful energy demands. This appears to be the principal reason for the low price elasticities of oil consumption that are implicit in the IIASA results.

A value of 0.54 (for CIES) is the highest among the intermediate-run price elasticities shown in table 4. It is unclear whether this response represents a controlled comparison between the price and the income effects of additional oil supplies. If this does represent a controlled comparison, the CIES scenarios imply that oil prices have an extraordinarily high impact upon long-term GNP growth rates. For the OECD region in the year 2000, the GNP index is 197 in CIESH versus 173 in CIESL (the high versus low demand scenario).

7. Concluding comment

This paper has shown that there continues to be a wide range of viewpoints on the long-range outlook for international energy supplies, demands and prices. Rather than attempt to promote an artificial consensus in this area, we believe that the role of the IEW is to reach second-order agreement. That is, how wide is the range of uncertainty likely to be? At a number of points, we have reported median values, but these are not intended as the best or the most likely forecasts. We use these because they represent perhaps the most descriptive single summary description of the responses. Any translation from poll results into probability distributions is at the risk of the translator.

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Energy Information Administration, Annual Energy Review 1983. DOE/EIA-03484(83), US Department of Energy, Washington DC, April 1984.

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S. Makridakis and R.L. Winkler, "Averages of Forecasts", Management Science, September 1983.

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K.E. Rosing and P. Odell, "The Future of Oil: A Re-Evaluation", Erasmus University, Rotterdam 1983.

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D. Yergin, "The Future of Oil Prices: the Perils of Prophecy", Arthur Andersen and Cambridge Energy Research Associates, Cambridge, Massachusetts, 1984.

APPENDIX A–1

International Energy Workshop poll

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, commercial, million tons of oil equivalent (mtoe) [1]				
3. Total consumption				
4. Total production				
5. Oil, consumption [2]				
6. Oil, production [2]				
7. Oil, exports – imports [2]				
8. Natural gas, consumption				
9. Natural gas, production				
10. Natural gas, exports – imports				
11. Coal, consumption [3]				
12. Coal, production [3]				
13. Coal, exports – imports [3]				
14. Hydro-electric and geothermal				
15. Nuclear energy				
16. Solar and other renewables				
Secondary energy, terrawatt-hours (TWh)				
17. Total electricity generation				

1. Useful approximations: *1 mtoe* $\approx 10^{13}$ *kilocalories*
0.65 mtoe $\approx$ *1 million tons coal*
0.83 mtoe $\approx$ *1 billion cubic metres natural gas*
23 mtoe $\approx$ *1 quad BTU*
50 mtoe/year $\approx$ *1 million barrels daily*

2. Oil includes natural gas liquids, unconventional oils and synthetics based on tar sands and shale oil.
3. Coal includes soid fuels such as lignite and peat. Includes coal consumed for manufacture of synthetic fuels.

APPENDIX A–2

IEW poll respondents, January 1985

This includes only those responses dated 1983 or later.

	Organization/projects	Last year reported	Country/region coverage
AGABD, AGAHD, AGALD	American Gas Association – base, low, high demand. May 1984	2000	US
ASSU	Academy of Sciences of the USSR, June 1983	2010	USSR
BLNCE	BALANCE Canadian Energy Model, T.E. Daniel and H.M. Goldberg, University of Alberta, January 1984	2000	Canada
BNL	Brookhaven National Laboratory, 1983	2010	US
BP	British Petroleum, October 1984	2000	4, 7, 5+6. OECD Europe, US
CEC, CECCP, CECEU, CECFC	Commission of the European Communities – cooperation, Europe and free competition scenarios, and results identical for all three scenarios, June 1983	2000	Belgium, Denmark, Federal Rep. of Germany, France, Greece, Ireland, Italy, Luxembourg, Netherlands, UK
CERG	Cambridge Energy Research Group, 1985	2010	4,7
CHASE	Chase Manhattan Bank, March 1983	2000	7
CHVRN	Chevron Corporation, July 1984	2010	4
CIESH, CIESL	Center for International Energy Studies, Erasmus University – high and low energy growth, October 1984	2010	3–8
CON	Conoco, April 1984	2000	4–7, 5+6, Africa, Asia, Japan, Latin America, Middle East, OECD Europe, other OECD, US

CPOM	Central Planning Office, Netherlands, October 1984	2000	Netherlands
CRAN	A. Cranston, US Senate, August 1983	2000	US
CRIEH, CRIEL, CRIER	Central Research Institute of Electric Power Industry – high, low and reference GNP growth, November 1983	2010	Japan
CZMOE	Czechoslovakian Federal Ministry of Fuel and Energy	2000	Czechoslovakia
DNMOE	Danish Ministry of Energy, 1983	2000	Denmark
DOE	US Department of Energy, Office of Economic Analysis, January 1985	2010	4–7, US
DRI	Data Resources Inc., November 1984	2000	4, 5, 6, US
DRIE	DRI Europe, September 1984	2000	OECD Europe
EEF	UN Economic Commission for Europe, General Energy Unit, "An Efficient Energy Future", March 1983	2000	1, US
EIA	US Energy Information Administration – 1990 mid-price scenario, 1984	1990	4, 7, 5+6, OECD Europe/North America/Pacific
ENI	Ente Nazionale Idrocarburi, 1983	1990	4
EPRIM, EPRIR	O. Yu. Electric Power Research Institute – minimum and reasonable expectations, December 1983	2000	US
ERIEA	J. Edmonds and J. Reilly, Institute for Energy Analysis, July 1983	2000	1–4, 7, 8, Middle East, other market economies
ESCN	Energy Study Centre, Netherlands, December 1984	2000	Netherlands
ETAMC	ETA-MACRO, J.-L. Aburto, A.S. Manne and S. Rogers, Trinational Project, January 1985	2010	Canada, Mexico, US

ETSHD ETSLD	Energy Technology Systems Analysis Project of the International Energy Agency – high and low demand cases, 1983	2010	Australia, Austria, Belgium, Federal Rep. of Germany, Ireland, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, UK, US: Sum of 14 IEA countries
GATLY	D. Gately, New York University, 1983	2000	5, 7
GNVBD, GNVHD, GNVLD	University of Geneva – base, high and low demand, August 1983	2000	Switzerland
GRI	Gas Research Institute, October 1984	2000	US
GULFC, GULFH, GULFP	Gulf Oil Corporation, Economics Division, slow climb, hard lines and plateau scenarios, December 1983	2000	7, US
HNPO	Hungarian National Planning Office, Energy Modelling Group, January 1984	2010	Hungary
IAEAH, IAEAL	International Atomic Energy Agency – high and low demand, September 1984	2000	4, Eastern Europe, Latin America, OECD Europe/ North America/ Pacific
IEA	International Energy Agency, 1984	2000	4
IFPF, IFPM, IFPS	Institut Francais du Petrole – solid and moderate revival, stagnation, September 1983	2000	3–8
IIAGS	International Institute for Applied Systems Analysis – gas study, July 1984	2010	OECD Europe
IIASA	International Institute for Applied Systems Analysis, November 1983	2010	1–4, 7–8
INBST	J. Brady, National Board for Science and Technology, Ireland, April/May 1983	2010	Ireland

IND	Standard Oil Company of Indiana, May 1984	2000	1–8, other markets, other CPE
IPE	IPE Model, M. Choucri, Massachusetts Institute of Technology, April 1984	2000	4–7
ISP	K.-P. Moeller, ISP Energy Projections, 1983	2000	Federal Rep. of Germany
JAERI	Japan Atomic Energy Research Institute, March 1983	2010	Japan
LEDB	W.J. Schmidt, University of Mining and Metallurgy, Leoben, 1983	2010	8
MERZ	N. Merzagora, Economic Analysis Division, ENEA, June 1983	2000	Italy
NEB	National Energy Board, September 1984	2000	Canada
NGODP	International Natural Gas Study, Harvard University, and the OPEC Downstream Project, East-West Centre, B. Mossavar-Rahmani and F. Fesharaki, 1983	1990	5; Algeria, Ecuador, Gabon, Indonesia, I.R. Iran, Iraq, Kuwait, S.P. Libyan A.J., Nigeria, Qatar, Saudi Arabia, UAE, Venezuela
NRMPE	Norwegian Royal Ministry of Petroleum and Energy, 1984	2000	Norway
OBENA, OBENB	Observatoire de l'Energie – scenarios A and B, January 1983	2000	France
OLADE	Organization Latinoamericana de Energia, May 1983	2000	Latin America
OPEC, OPECD	Organization of the Petroleum Exporting Countries – long-term energy models, domestic energy requirements, 1983	2010	4–7
PILOT	PILOT Model, P.H. McAllister and Model, Stanford University, March 1984	2000	US
PIRMC	Petroleum Industry Research Foundation, Inc., September 1983	2000	3, 7, 8

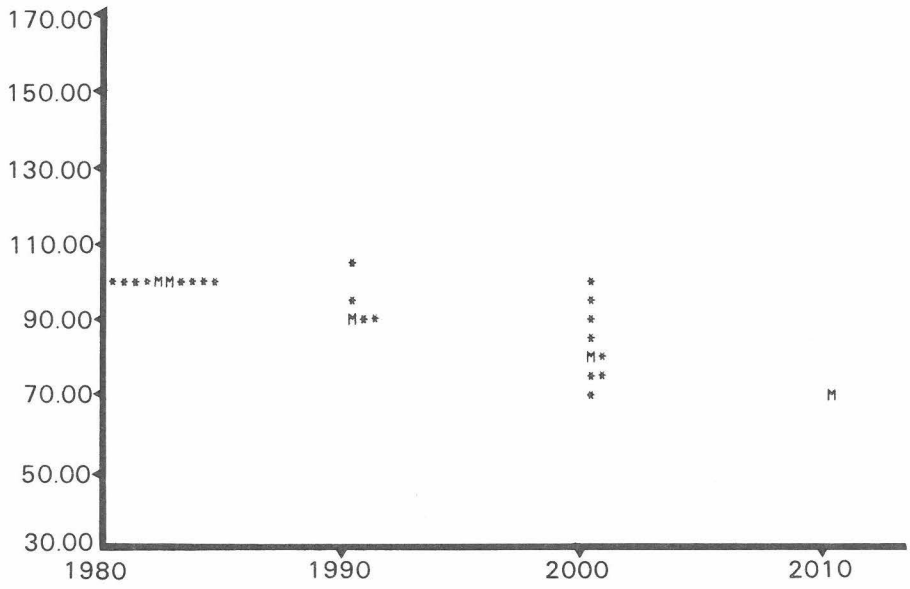
REGBD, REGHD, REGLD	L. Lundqvist, Research Group for Urban and Regional Planning – base, high and low demand, 1984	2010	Sweden
RESPH	Respondent, H, 1983	2000	Japan
RESPI	Respondent, I, 1983	2000	7; 5+6, Japan, OECD Europe, US
RESPJ	Respondent, J, March 1984	2000	Canada, Mexico, US
RESPK, RESPL	Respondents, K, L, December 1984	2000	4, 5, US
RESPM, RESPP	Respondents M, P, December 1984	2000	8
ROL	K. Roland, Central Bureau of Statistics, Norway, February 1984	2000	OECD Europe
ROWSE	J. Rowse, University of Calgary, November 1984	2000	Canada
SAUNS, SAUNV	H. Saunders, TOSCO, smooth and volatile scenarios, January 1984	2000	3–7
SHLLM, SHLLR	Shell International – muddling-through and restructuring, December 1984	2000	7, 8
SINGR	S.F. Singer, 1983	2010	4
SMIE1, SMIE2	Spanish Ministry of Industry and Energy – scenarios 1 and 2, 1983	2000	1, 2, 8, Africa, Japan, Latin America, Middle East, OECD Europe/North America/America, South Asia, South-East Asia, and Australasia
SMIL	V. Smil, University of Manitoba, 1983	2010	3, 8
SWEA	Swedish National Energy Administration, December 1984	1990	Sweden

TATA	R.K. Pachawri, Tata Energy Research Institute, 1983	2010	India
TAVNR	TAVANIR Corporation, Energy Ministry of Iran, April 1984	2010	I.R. Iran
TRT4, TRT6	TRT Model, A.S. Manne and P.V. Preckel, Stanford University – elasticities of OECD oil demand substitution = .40, .60, December 1983	2000	4–7
UN	United Nations Statistical Office, June 1984	1980	1–8
UNIDO	United Nations Industrial Development Organization, February 1983	1990	2, Eastern Europe, Japan, Latin America, OECD Europe/North America
WBK	World Bank, 1984	1990	1–8
WECHG, WECLG	World Energy Conference – high and low growth, December 1983	2000	1–3, 7, 8, 5+6, Africa south of Sahara, Latin America, North Africa and Middle East, OECD Europe/North America/Pacific, South Asia/ South-East Asia
WILPP, WILRF	J. Willars, policy projection and reference case, November 1983	1990	Mexico

APPENDIX A–3

Energy-GDP ratios, by region

Soviet Union, Eastern Europe and sub-regions

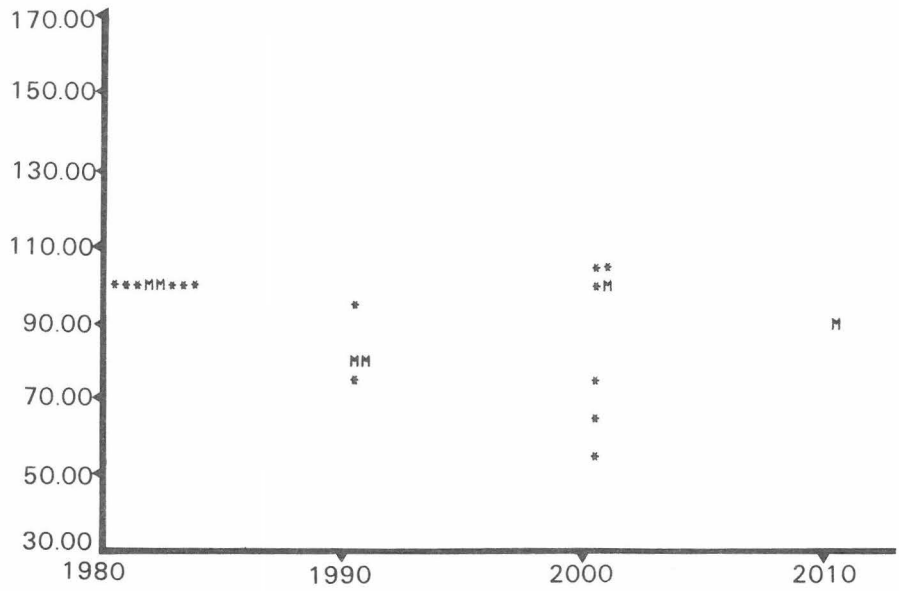


Notes: *1980 = 100.*
If there is an even number of poll responses, the two projections closest to the median are denoted by M.

Medians:		100.000			90.929			79.388			67.560
HNPO	HNGRY	100.000	ASSU	USSR	104.168	ASSU	USSR	100.679	IIASA	A1	67.560
ASSU	USSR	100.000	IND	A1	93.488	SMIE1	A1	92.584			
WECLG	A1	100.000	WBK	A1	90.929	SMIE2	A1	92.495			
WECHG	A1	100.000	HNPO	HNGRY	90.164	IND	A1	85.813			
WBK	A1	100.000	IIASA	A1	87.861	WECLG	A1	79.388			
SMIE2	A1	100.000				HNPO	HNGRY	78.947			
SMIE1	A1	100.000				IIASA	A1	77.188			
IND	A1	100.000				WECHG	A1	72.816			
IIASA	A1	100.000				ERIEA	A1	69.731			
ERIEA	A1	100.000									

Energy-GDP ratios, by region

China and other Asian planned economies

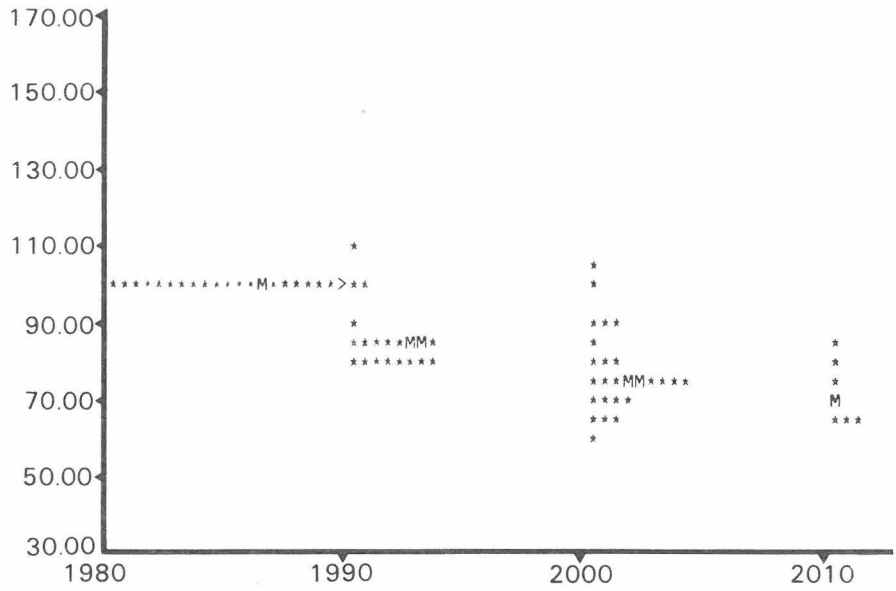


Notes: *1980 = 100.*
If there is an even number of poll responses, the two projections closest to the median are denoted by M.

Medians:		100.000			79.049			97.906			90.411
WECLG	A2	100.000	IIASA	A2	92.919	ERIEA	A2	103.772	IIASA	A2	90.411
WECHG	A2	100.000	IND	A2	79.322	SMIE1	A2	102.826			
WBK	A2	100.000	WBK	A2	78.776	IIASA	A2	100.650			
SMIL	A2	100.000	SMIL	A2	74.479	WECLG	A2	97.906			
SMIE1	A2	100.000				WECHG	A2	73.570			
IND	A2	100.000				IND	A2	65.120			
IIASA	A2	100.000				SMIL	A2	57.065			
ERIEA	A2	100.000									

Energy-GDP ratios, by region

OECD North America and sub-regions

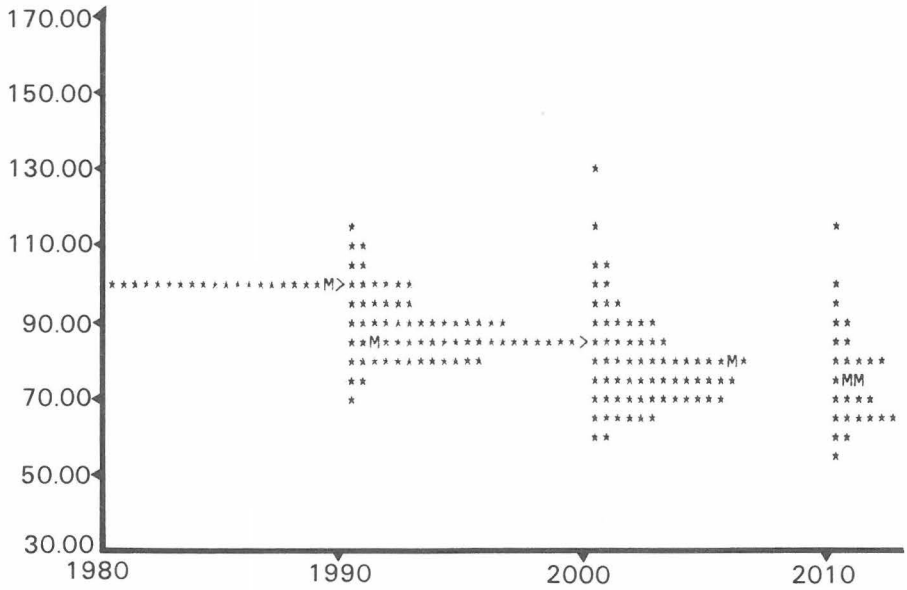


Notes: 1980 = 100.
If there is an even number of poll responses, the two projections closest to the median are denoted by M.

Medians:		100.000			83.166			74.314			68.898
RESPI	US	100.000	ETAMC	CAN	107.683	BLNCE	CAN	102.874	BNL	US	83.497
PILOT	US	100.000	BNL	US	98.955	ETAMC	CAN	97.740	ETSHD	US	80.153
GULFP	US	100.000	BLNCE	CAN	98.940	SMIE2	OECDN	88.574	ETSLD	US	74.443
GULFH	US	100.000	NEB	CAN	90.530	SMIE1	OECDN	88.490	ETAMC	US	68.898
GULFC	US	100.000	ETSLD	US	87.289	BNL	US	88.235	DOE	US	65.961
GRI	US	100.000	ETSHD	US	86.094	ETSHD	US	82.910	DRI	US	65.554
ETSLD	US	100.000	EPRIR	US	84.569	NEB	CAN	79.968	GRI	US	64.515
ETSHD	US	100.000	GULFH	US	84.301	GULFH	US	78.068			
ETAMC	US	100.000	EPRIM	US	84.091	ETSLD	US	77.855			
EPRIR	US	100.000	GRI	US	83.191	WECLG	OECDN	77.028			
EPRIM	US	100.000	EIA	OECDN	83.140	WECHG	OECDN	75.351			
DRI	US	100.000	RESPI	US	83.136	EPRIR	US	74.777			
DOE	US	100.000	DRI	US	81.972	RESPI	US	74.681			
CON	US	100.000	ETAMC	US	81.847	DRI	US	73.947			
BP	US	100.000	DOE	US	80.153	GRI	US	73.374			
BNL	US	100.000	GULFP	US	79.560	EPRIM	US	73.338			
AGALD	US	100.000	CON	US	79.502	ETAMC	US	72.679			
AGAHD	US	100.000	GULFC	US	78.645	DOE	US	72.573			
AGABD	US	100.000	PILOT	US	78.316	GULFP	US	71.703			
WECLG	OECDN	100.000	BP	US	78.224	GULFC	US	71.614			
WECHG	OECDN	100.000				PILOT	US	68.324			
SMIE2	OECDN	100.000				CON	US	68.035			
SMIE1	OECDN	100.000				BP	US	67.339			
EIA	OECDN	100.000				AGALD	US	63.412			
NEB	CAN	100.000				AGABD	US	62.833			
ETAMC	CAN	100.000				AGAHD	US	60.419			
BLNCE	CAN	100.000									

Energy-GDP ratios, by region

OECD Europe and sub-regions

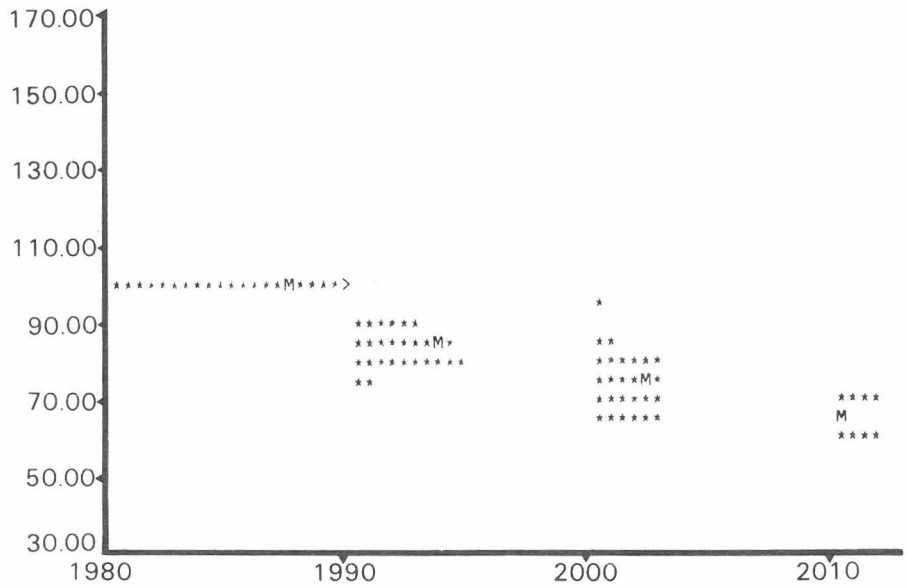


Notes: 1980 = 100.
If there is an even number of poll responses, the two projections closest to the median are denoted by M.

Medians:		100.000			86.290				78.862				73.558	
ETSLD	UK	100.000	ETSHD	SPAIN	115.009	CECFC	EIRE	128.205	ETSHD	SPAIN	113.269
ETSHD	UK	100.000	CECFC	EIRE	111.789	ETSHD	SPAIN	112.505	ETSLD	SPAIN	98.112
CECFC	UK	100.000	CECEU	EIRE	109.127	CECCP	EIRE	105.337	REGHD	SWEDE	96.979
CECEU	UK	100.000	CECFC	ITALY	106.870	CECEU	EIRE	102.941	ETSHD	NLAND	88.971
CECCP	UK	100.000	CEC	GREC	106.667	ETSLD	SPAIN	99.679	ETSLD	NLAND	88.431
GNVLD	SWISS	100.000	ETSHD	NLAND	101.695	CECFC	ITALY	98.728	ETSHD	EIRE	85.085
GNVHD	SWISS	100.000	ETSHD	AUSTR	100.910	REGHD	SWEDE	97.426	INBST	EIRE	84.255
GNVBD	SWISS	100.000	ETSLD	NLAND	100.275	CEC	GREC	95.238	ETSLD	EIRE	81.699
ETSLD	SWISS	100.000	ETSLD	SPAIN	99.421	ETSHD	NLAND	93.599	ETSHD	AUSTR	81.350
ETSHD	SWISS	100.000	ETSLD	AUSTR	98.932	ETSLD	NLAND	92.308	ETSHD	SWISS	80.228
SWEA	SWEDE	100.000	CECCP	EIRE	98.425	NRMPE	NORWY	92.069	ETSLD	NORWY	80.175
REGLD	SWEDE	100.000	NRMPE	NORWY	97.344	SMIE1	OECDE	91.681	ETSLD	AUSTR	78.074
REGHD	SWEDE	100.000	REGHD	SWEDE	97.318	SMIE2	OECDE	91.544	ETSLD	SWISS	75.503
REGBD	SWEDE	100.000	ETSLD	NORWY	96.038	ETSHD	AUSTR	88.944	ETSLD	SWEDE	74.074
ETSLD	SWEDE	100.000	CECCP	ITALY	95.570	WECLG	OECDE	87.693	ETSLD	UK	73.042
ETSHD	SWEDE	100.000	CECEU	ITALY	95.420	MNDMS	FR	87.043	ETSLD	OSTER	71.942
ETSLD	SPAIN	100.000	EIA	OECDE	93.118	ETSLD	NORWY	86.580	ETSLD	FRG	71.659
ETSHD	SPAIN	100.000	ETSLD	SWEDE	91.857	ETSLD	AUSTR	86.004	ETSHD	BELGM	69.847
ETSLD	OSTER	100.000	CON	OECDE	91.682	ETSHD	EIRE	85.942	REGBD	SWEDE	67.592
ETSHD	OSTER	100.000	CECFC	FR	91.272	INBST	EIRE	83.494	ETSHD	UK	65.212
WECLG	OECDE	100.000	CECFC	DNMRK	91.173	CPON	NLAND	83.030	ETSHD	FRG	65.048
WECHG	OECDE	100.000	ETSLD	EIRE	91.075	ETSHD	SWISS	82.763	ETSHD	OSTER	64.147
SMIE2	OECDE	100.000	BP	OECDE	90.847	CECEU	ITALY	82.387	ETSLD	BELGM	63.477
SMIE1	OECDE	100.000	ETSLD	BELGM	90.687	ETSLD	SWEDE	81.967	ETSHD	NORWY	63.025
RESPI	OECDE	100.000	ETSHD	NORWY	90.618	CECFC	FR	81.822	ETSHD	SWEDE	62.832
EIA	OECDE	100.000	DRIE	OECDE	90.404	CECFC	DNMRK	81.222	ETSLD	ITALY	60.752
DRIE	OECDE	100.000	RESPI	OECDE	90.181	ETSLD	EIRE	80.808	ETSHD	ITALY	59.486
CON	OECDE	100.000	ETSHD	EIRE	89.869	CECCP	ITALY	80.673	REGLD	SWEDE	54.720
BP	OECDE	100.000	CPON	NLAND	88.423	RESPI	OECDE	80.578			
NRMPE	NORWY	100.000	CECFC	UK	88.333	CON	OECDE	80.351			
ETSLD	NORWY	100.000	ETSLD	FRG	88.274	ETSLD	SWISS	80.247			
ETSHD	NORWY	100.000	CECCP	DNMRK	87.060	ETSLD	BELGM	79.966			
ETSLD	NLAND	100.000	ETSLD	UK	86.793	ETSHD	BELGM	79.451			
ETSHD	NLAND	100.000	CECCP	UK	86.290	ETSLD	FRG	79.294			
ESCN	NLAND	100.000	ETSLD	SWISS	86.207	BP	OECDE	78.862			
CPON	NLAND	100.000	CECFC	NLAND	86.207	WECHG	OECDE	78.560			
CECFC	NLAND	100.000	INBST	EIRE	86.133	CECFC	UK	77.027			
CECEU	NLAND	100.000	ETSHD	BELGM	86.120	ETSLD	UK	76.776			
CECCP	NLAND	100.000	MNDMS	FR	85.959	ETSHD	NORWY	76.244			
CEC	LUXBG	100.000	CECCP	FR	85.550	CECFC	NLAND	75.353			
MERZ	ITALY	100.000	ETSHD	SWEDE	85.182	ESCN	NLAND	74.869			
ETSLD	ITALY	100.000	CECFC	FRG	85.156	ETSHD	FRG	73.731			
ETSHD	ITALY	100.000	MERZ	ITALY	85.034	ETSHD	SWEDE	73.694			
CECFC	ITALY	100.000	ETSHD	FRG	84.541	CECEU	NLAND	73.216			
CECEU	ITALY	100.000	ETSHD	UK	84.283	ISP	FRG	73.209			
CECCP	ITALY	100.000	CECEU	NLAND	83.802	CEC	LUXBG	73.099			
CEC	GREC	100.000	CECEU	UK	83.740	ETSLD	OSTER	73.052			
ISP	FRG	100.000	CECEU	FR	83.655	ETSHD	UK	72.991			
ETSLD	FRG	100.000	ISP	FRG	83.615	REGBD	SWEDE	72.522			
ETSHD	FRG	100.000	ETSHD	ITALY	83.144	CECFC	FRG	72.474			
CECFC	FRG	100.000	OBENA	FR	83.064	MERZ	ITALY	72.333			
CECEU	FRG	100.000	CECCP	NLAND	82.552	DRIE	OECDE	72.322			
CECCP	FRG	100.000	ETSHD	ITALY	82.457	ETSHD	OSTER	71.851			
OBENB	FR	100.000	REGBD	SWEDE	82.079	OBENA	FR	71.661			
OBENA	FR	100.000	OBENB	FR	81.731	CECCP	FR	71.461			
MNDMS	FR	100.000	ESCN	NLAND	81.579	CECCP	UK	70.455			
CECFC	FR	100.000	DNMOE	DNMRK	81.197	CECEU	UK	69.207			
CECEU	FR	100.000	CEC	LUXBG	80.000	ETSHD	ITALY	69.200			
CECCP	FR	100.000	CEC	BELGM	80.000	ETSLD	ITALY	68.888			
INBST	EIRE	100.000	CECCP	FRG	79.772	CECEU	FR	68.510			
ETSLD	EIRE	100.000	CECEU	DNMRK	79.745	CECCP	NLAND	67.979			
ETSHD	EIRE	100.000	CECEU	FRG	79.242	CECCP	DNMRK	67.189			
CECFC	EIRE	100.000	ETSHD	SWISS	78.914	DNMOE	DNMRK	66.288			
CECEU	EIRE	100.000	ETSHD	OSTER	78.463	CECEU	DNMRK	65.434			
CECCP	EIRE	100.000	SWEA	SWEDE	76.086	CECCP	FRG	64.609			
DNMOE	DNMRK	100.000	ETSLD	OSTER	74.405	CEC	BELGM	63.353			
CECFC	DNMRK	100.000	REGLD	SWEDE	70.994	REGLD	SWEDE	62.681			
CECEU	DNMRK	100.000				CECEU	FRG	61.587			
CECCP	DNMRK	100.000				OBENB	FR	60.850			
ETSLD	BELGM	100.000									
ETSHD	BELGM	100.000									
CEC	BELGM	100.000									
ETSLD	AUSTR	100.000									
ETSHD	AUSTR	100.000									

Energy-GDP ratios, by region

Other OECD and sub-regions

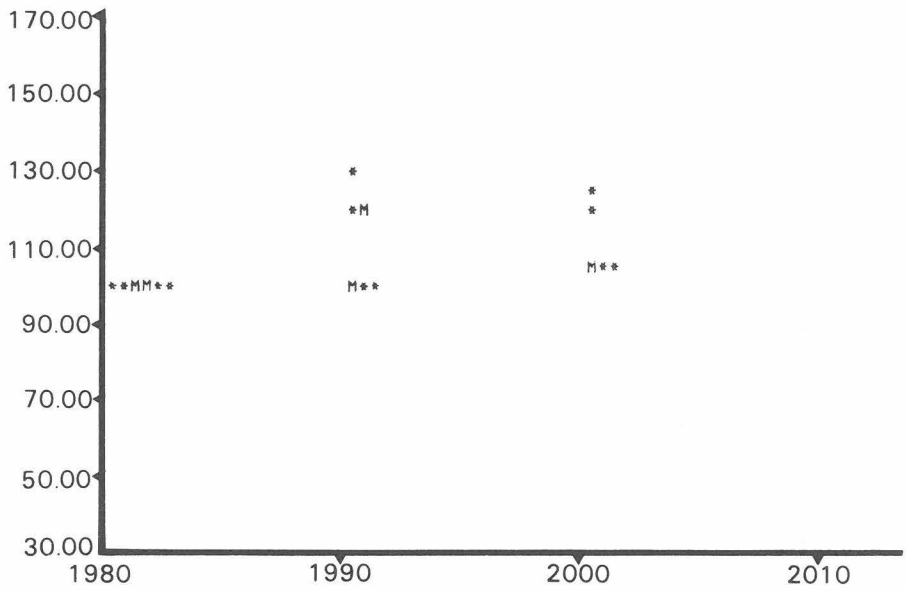


Notes: 1980 = 100.
If there is an even number of poll responses, the two projections closest to the median are denoted by M.

Medians:		100.000			84.338				73.513				65.753	
WECLG	OECDP	100.000	IEA	A4	91.640	SMIE1	JAPAN	95.388	ETSHD	JAPAN	72.496
WECHG	OECDP	100.000	IFPS	A4	91.185	IFPS	A4	86.906	CHVRN	A4	70.188
EIA	OECDF	100.000	IFPM	A4	89.803	IEA	A4	83.063	JAERI	JAPAN	69.247
CON	OECDO	100.000	RESPI	JAPAN	88.540	IFPM	A4	81.937	IIASA	A4	67.800
SMIE1	JAPAN	100.000	EIA	OECDP	88.092	WECLG	OECDP	81.005	ETSLD	JAPAN	65.753
RESPI	JAPAN	100.000	EIA	A4	87.922	ERIEA	A4	80.510	CRIEL	JAPAN	62.242
RESPH	JAPAN	100.000	CON	OECDO	87.273	RESPI	JAPAN	78.815	CRIER	JAPAN	60.471
JAERI	JAPAN	100.000	IFPF	A4	86.942	CON	OECDO	78.370	CERG	A4	57.815
ETSLD	JAPAN	100.000	ENI	A4	86.296	CHVRN	A4	77.891	CRIEH	JAPAN	57.720
ETSHD	JAPAN	100.000	CHVRN	A4	85.295	IIASA	A4	75.809			
CRIER	JAPAN	100.000	CON	A4	84.851	IFPF	A4	75.695			
CRIEL	JAPAN	100.000	IIASA	A4	84.559	WECHG	OECDP	74.291			
CRIEH	JAPAN	100.000	ETSHD	JAPAN	84.442	ETSHD	JAPAN	74.013			
CON	JAPAN	100.000	WBK	A4	84.338	CON	A4	73.513			
WBK	A4	100.000	JAERI	JAPAN	83.589	JAERI	JAPAN	72.757			
SAUNV	A4	100.000	LIEF	A4	81.788	IND	A4	69.457			
SAUNS	A4	100.000	CERG	A4	81.193	ETSLD	JAPAN	69.375			
LIEF	A4	100.000	ETSLD	JAPAN	81.189	CERG	A4	68.387			
IND	A4	100.000	BP	A4	80.857	RESPH	JAPAN	68.306			
IIASA	A4	100.000	IND	A4	80.562	SAUNS	A4	67.692			
IFPS	A4	100.000	RESPH	JAPAN	80.133	CRIEL	JAPAN	67.549			
IFPM	A4	100.000	CRIER	JAPAN	79.101	CRIER	JAPAN	67.068			
IFPF	A4	100.000	CRIEH	JAPAN	78.627	LIEF	A4	66.855			
IEA	A4	100.000	CRIEL	JAPAN	78.419	CON	JAPAN	66.536			
ERIEA	A4	100.000	SAUNS	A4	78.142	CRIEH	JAPAN	65.426			
ENI	A4	100.000	CON	JAPAN	77.032	BP	A4	64.134			
EIA	A4	100.000	SAUNV	A4	76.694	SAUNV	A4	62.951			
CON	A4	100.000									
CHVRN	A4	100.000									
CERG	A4	100.000									
BP	A4	100.000									

Energy-GDP ratios, by region

OPEC



Notes: 1980 = 100.
If there is an even number of poll responses, the two projections closest to the median are denoted by M.

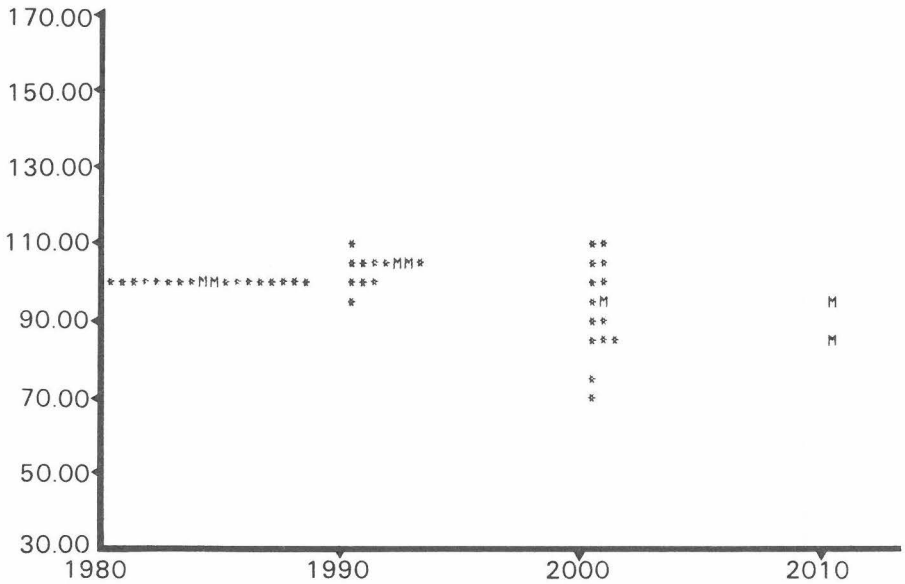
Medians:		100.000
WBK	A5	100.000
IND	A5	100.000
IFPS	A5	100.000
IFPM	A5	100.000
IFPF	A5	100.000
CON	A5	100.000

		110.024
IND	A5	130.818
WBK	A5	121.139
CON	A5	120.047
IFPM	A5	100.000
IFPF	A5	98.160
IFPS	A5	97.973

		104.452
IND	A5	124.919
CON	A5	122.354
IFPF	A5	104.452
IFPM	A5	102.767
IFPS	A5	102.740

Energy-GDP ratios, by region

Non-OPEC developing countries and sub-regions



Notes: *1980 = 100.*
If there is an even number of poll responses, the two projections closest to the median are denoted by M.

Medians:		100.000			103.816			92.930			90.901
WILRF	MEX	100.000	TATA	INDIA	109.074	IFPF	A6	109.740	TATA	INDIA	95.832
WILPP	MEX	100.000	SAUNV	A6	106.578	IFPM	A6	108.285	ETAMC	MEX	85.970
WECLG	SEASI	100.000	SAUNS	A6	105.441	IFPS	A6	106.862			
WECLG	SASIA	100.000	IFPF	A6	104.908	SAUNS	A6	104.999			
WECLG	AFSS	100.000	IFPM	A6	104.517	SAUNV	A6	102.162			
WECHG	SEASI	100.000	IFPS	A6	104.085	CON	A6	102.151			
WECHG	SASIA	100.000	CON	A6	103.547	TATA	INDIA	95.272			
WECHG	AFSS	100.000	WILRF	MEX	103.122	WECLG	SASIA	92.930			
TATA	INDIA	100.000	IND	A6	99.718	IND	A6	90.127			
ETAMC	MEX	100.000	WILPP	MEX	99.394	WECHG	SASIA	88.551			
WBK	A6	100.000	WBK	A6	99.006	WECHG	AFSS	86.939			
SAUNV	A6	100.000	ETAMC	MEX	95.998	WECLG	AFSS	86.213			
SAUNS	A6	100.000				ETAMC	MEX	86.196			
IND	A6	100.000				WECLG	SEASI	75.428			
IFPS	A6	100.000				WECHG	SEASI	71.146			
IFPM	A6	100.000									
IFPF	A6	100.000									
CON	A6	100.000									