SCENARIOS: THE GENTLE ART OF RE-PERCEIVING

One Thing or Two Learned While Developing
Planning Scenarios for Royal Dutch/Shell

by

Pierre Wack

9-785-042

Pierre Wack
Senior Lecturer
Harvard Business School
December 1984

Scenarios: The Gentle Art of Re-Perceiving

(One thing or two learned while developing Planning Scenairos for Royal Dutch/Shell

Scenarios are clearly far more popular in the world of "futurists" and commentato than in the world of decisionmakers. Futurists have learned to create "interesti scenarios but rarely ones which attract more than passing interest from decision-makers. There are important differences between scenarios which tell a story and scenarios which are of real help for decisionmakers--"decision scenarios." Scena that merely quantify alternative outcomes of obvious uncertainties (e.g. the pric of oil may be $20 or $40 per barrel) are <u>not</u> helpful to decisionmakers. What mak the difference between such first generation scenarios and decision scenarios is the subject of this paper. It is illustrated by describing the evolution of the planning process in Royal Dutch/Shell, where there is now a considerable body of experience stretching over a decade in dealing with scenarios.

SCENARIOS: THE GENTLE ART OF RE-PERCEIVING

Introduction

Very few companies today would say they are satisfied with the way they deal with an increasingly fluid and turbulent business environment. Traditional planning used to be based on forecasts, which worked reasonably well in the relatively stable 1950s and 1960s. But since the early 1970s, forecasting errors have become more frequent and occasionally of dramatic and unprecedented magnitude. It is not that forecasts are always wrong, more often then not, they can be reasonably accurate. This is what makes them so dangerous. Forecasts are usually constructed on the assumption that tomorrow's world will be much like today's. True, the world does not always change, and forecasts work for a while. But sooner or later they fail—and just when they are needed most: they fail to anticipate major shifts in the business environment which can make whole strategies obsolete (see box: Two "a fortiori" examples).

It is likely that managers in most industries have more than once had direct experience of how badly wrong forecasts can now be. On this point, there is probably a large consensus.

My thesis—on which agreement may be less general--is this: the way to get out of our problem is not to look for better forecasts by perfecting our techniques, or trying to hire more or better forecasters. There are just too many forces at work to hope to get "the" right forecast. Major changes have occurred in areas that were believed to be not at all susceptible to change, often outside the boundaries of an industry's normal business environment. The future is no longer stable; it is now a moving target for which no single "right" projection can be deduced from past behavior.

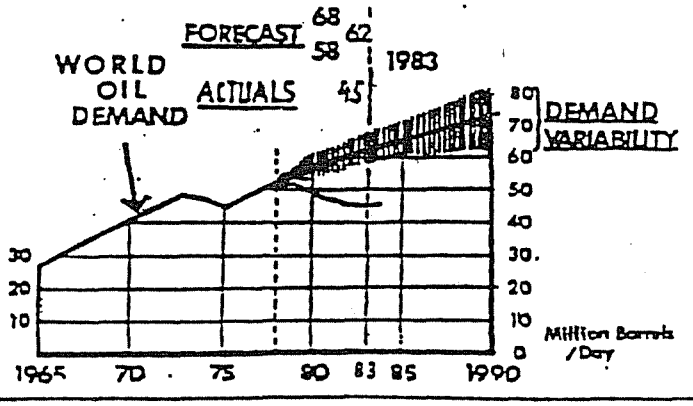
Few areas have seen such a concentration of the best techniques, and many of the best brains in the profession, as short-ter macroeconomic forecasting in the U.S. Stephen MacNees, of the Feder Reserve Bank of Boston, has been analyzing the track record of the best known economic forecasters since 1970 (New England Economic Review, November 1983). During more than half this period, forecast were quite successful. But on four occasions, the magnitude of erro was sizeable. MacNees observes that:

- "Forecasts made from 1973 through early 1974 initially did not foresee the recession, and later misinterpreted the severe recession as an energy spasm'."
- "Forecasts made from mid-1977 through early 1978 did not capture the acceleration of the inflation rate in 1978 and 1979."
- "Forecasts made in 1981 and early 1982 underestimated the severity of the 1982 recession, and the deceleration of inflation that accompanied it." In the summer of 1981, according to MacNees, the median forecast had predicted 3.2 growth in U.S. GNP for 1982. Instead, the economy plunged into a deep recession, with a GNP decline of 1.8%. As the journalist Warren Brookes commented, "This is like forecasting partly cloudy, and getting a 10-inch snow storm instead. After all, in economics as in meteorology, it's th ability to predict stormy change that makes forecasting useful."

Many business cases illustrate a similar phenomenon in longer-term forecasting. The oil industry—which, prior to 1973, enjoyed the steadiest growth of all major industries—is still living with its failure to anticipate the turbulent changes that have occurred since then. Here is one major oil company's (not Shell) forecast of oil demand, made as late as 1978. The example is chosen because this company allocates more resources to analyzing the future environment than most companies do and is well respected for its professionalism. Yet note how far outside the forecast demand range reality (the red line) proved to be.

"WORLD ENERGY OUTLOOK"

APRIL 1978



The only solution, I believe, is to accept uncertainty, try to understand it and make it part of your reasoning. Uncertainty today is not just an occasional, temporary deviation from a reasonable predictability; it is a basic structural feature of the business environment. Therefore, the method used to think about and plan for the future must be made appropriate to the new nature of the business environment. The Royal Dutch/Shell Group of companies* has learned that decision scenarios are such a method. According to former Group Managing Director André Bénard: "Experience has taught us that the scenario technique is much more conducive to forcing people to think about the future than the forecasting techniques we formerly used" ("Worldoil and Cold Reality," Harvard Business Review, November 1980).

Some planners say they know all about scenarios, that they have tried them, but their companies did not like them. I would answer that with two points (which will be developed at length below:

- Most scenarios merely quantify alternative outcomes of obvious uncertainties (e.g., the price of oil may be $20 or $40 per barrel). Such scenarios are not helpful to

---

*In this paper I use the words "Royal Dutch/Shell" or "Shell" to describe the Royal Dutch/Shell Group of companies, or sometimes as convenient shorthand to describe the management and planning functions within the central service companies of that Group in London and The Hague. Usually I should be taken as excluding Shell Oil Company, U.S.A. which—as a majority-owned public company in its own right—has undertaken its own planning for its own operations. I also use words like "company" as shorthand when what is really described is a complex group of companies of varying degrees of self-sufficiency and independence of operation, most of which are obliged to plan for a future in their own national economic and political environments as well as to be an integral part of the Group of which they are members. I would not like to mislead anyone into thinking that any one person, manager or planner is able to have a clear view of it all.

decision makers. We call them "first generation" scenarios. As will be seen, decision scenarios are quite different. (This explains why scenarios are usually more popular with futurists and planners than with the managers who are intended to use them).

- Good scenarios are not enough. To be effective, they must involve management, top and middle, in understanding and anticipating the unfolding business environment much more intimately than would be the case in the traditional planning process. Scenarios can be successful in structuring uncertainty only when (1) they are based on a sound analysis of reality, and (2) they change the decision-maker's assumptions about how the world works and compel him to change his image of reality. This is different—and more—than simply designing good scenarios. A willingness to face uncertainty and to understand the forces driving it requires an almost revolutionary transformation in a large organization. And this transformation process is as important as the development of the scenarios themselves.

What makes the difference between first generation scenarios and decision scenarios, and how to achieve an intimate involvement of management in the process, is the subject of this paper. It is illustrated by describing the evolution of the planning process in Shell, where there is now a considerable body of experience in dealing with scenarios. As you will see, the concept and the technique we arrived at after some 10 years is very

different from that with which we began—mainly because there were some highly instructive surprises along the way for all concerned.

Predetermined Versus Uncertain

Let me begin by appearing to contradict myself. In Shell we did not reject forecasts altogether. We did use forecasting techniques—not to predict, but in order to understand the forces driving the system, and we used them within the conceptual framework of "predetermined" elements.

Strictly speaking, it is only possible to forecast the future when all its elements are predetermined. By predetermined elements, we mean those events that have already occurred (or which almost certainly will occur) but whose consequences haven't yet unfolded. For example, if there are extraordinarily heavy monsoon rains at the upper part of the Ganges River basin, one can anticipate with certainty that something extraordinary will happen within two days at Rishikesh, which is at the foothills of the Himalayas,; in Allahabad, three to four days later; and at Benares, two days after that. This is not fortune telling or crystal-ball gazing. It is simply recognizing the future implications of the rainfall that has already occurred.

This careful sorting out of the predetermined elements, this identification of what has already happened, is basic to serious planning. But great care is needed with the predetermined. Paul Valéry, the twentieth-century French philosopher said, "Un fait mal observé est plus pernicieux qu'un mauvais raisonnement." (A poorly observed fact is more treacherous than a faulty train of reasoning.) That, too, is our experience: most of the errors of judgment in future-oriented studies come

not so much from faulty reasoning but from poorly, insufficiently observed facts.

There are always some predetermined elements. But seldom are there enough of them that a single-line forecast will suffice to handle the residual uncertainty. And a single-line forecast for a situation that is not fully predetermined is an intellectual swindle: decision makers facing uncertain situations have the right to know how uncertain they are. Many decisions will always remain some kind of a gamble, but it is dishonest to lead a manager to believe that he or she faces a safe, "business-as-usual" decision.

Accordingly, it is essential to try to put as much light on the uncertain elements as on the predetermined elements. They should not be swept under the carpet.

How Scenarios First Came to be Tried

Mechanical Planning Once Sufficed

The evolution of Shell's planning processes from 1945 to 1980 is outlined in Chart I. For the first ten years, in the aftermath of the destruction of World War II, the planning needed to be physical only: the company obviously had to build new production capacity, tankers, depots, pipelines, and refineries. The main challenge was to coordinate properly and schedule new facilities. A PERT approach to planning could be, and was, used. Almost no economic planning was needed during this decade.

Chart I

Steps in the Planning Approach in Shell 1945-1980

1945-55: Mainly "Physical" Planning
1955-65: Project Planning + Selectivity
1965-72: Unified Planning Machinery
1967 : Year-2000 Study initiated
1969-70: Horizon Year Planning Exercise
1971 : Experimental Use of Scenarios in central offices, London
1972-73: Introduction of Scenario-Planning
1975 : Introduction of Medium-Term Cyclical Scenarios
1976-77: Deepening "Societal Analysis" in Planning
1978-79: Deepening Geopolitical and Political Risk Analysis
1979-80: A Fresh Look at the Very Long Term + Development of Planning Capabilities Inside the Group

In the next decade, 1955-1965, financial considerations steadily became more important, but primarily on a project basis: the economics and the prospective rate of return on any given project were researched and evaluated. At the same time, Shell was introducing selectivity in its downstream sales objectives, choosing to develop those products and marketing channels that were most financially attractive. But no real integration of these projects was being made back to the crude oil production activities.

In 1965, Shell introduced a new system called, rather pompously, "Unified Planning Machinery" (UPM) to provide planning details for the whole chain of activity—from the oil in the ground, to the tanker, to the refinery, all the way to the gas station on the corner. UPM was a sophisticated, worldwide system that looked ahead six years: the first year in detail, the next five in broader lines. The system was designed, unconsciously, to develop Shell's businesses in a familiar, predictable world of "more of the same."

But six years was clearly a close horizon for an oil company, given the long lead times for new projects. Soon after the introduction of

UPM, therefore, a study to explore the business environment of the year 2000--and Shell's corporate position in it--was initiated. The Year-2000 Study revealed that the familiar, surprise-free business environment of continued expansion simply could not continue, not even until 1985. The oil world would have to switch from a buyers' to a sellers' market, with major discontinuities in the price of oil and great changes in interfuel competition. The huge size of the world oil and gas business projected in this study also signalled that major oil companies like Shell would become extremely large, heavily committed and much less flexible--almost dinosaur-like. And dinosaurs, as we all know, didn't adjust rapidly to sudden changes in their environment!

First discoveries about scenarios. The discontinuity discerned in the Year-2000 Study generated a one-time exercise called Horizon Year Planning (1969-1970). A dozen of the largest Shell companies throughout the world, along with the main service company "sectors" in London and The Hague (such as Exploration and Production, and Marketing), were asked to look ahead fifteen years, to 1985.

One of the participating companies in the Horizon Planning exercise was Shell Francaise, for which the author worked at the time. We were familiar with the scenario approach of the Hudson Institute and were interested in experimenting with it. France was a perfect testing ground, for there were two major uncertainties: the availability of natural gas (recently developed in France and the Netherlands), which was the only fuel that could compete with oil; and the political uncertainty concerning how France would manage its energy business.

France, at that time, operated under an oil régime that favored French national companies and severely limited Shell's market share there.

France, however, had just joined the Common Market and might have to change its oil regime to conform to EEC policy. There were therefore two options: France's oil regime would remain largely unchanged; or it would liberalize, after the transition period provided by the Treaty of Rome. Combining these two alternatives (Chart II) with the major uncertainty on gas availability gave us four scenarios.

Chart II

French Oil Régime

NATURAL GAS AVAILABILITY	Liberalized	Same
Large		
Small		

Here is where we began to make some discoveries. First, the amount of work required would be almost quadrupled if we provided the same sort of detail for each scenario that we gave to a normal UPM plan.

Accordingly, it quickly became clear that the same level of quantification and detail was not possible when planning with multiple scenarios. Just as the logistics of supply for an army have to be adapted to the type of war being fought, the logistics for scenario planning required a capacity to deal easily and quickly with alternatives. Without it, the whole process can be paralyzed by this bottleneck. In practice, this meant either developing flexible simulation models or having a number of specialists in key areas capable of rapidly assessing the consequences

of different alternatives in a given field. We later found that both capabilities were needed.

Another realization was that simply combining obvious uncertainties did not help much with decision making. It was known beforehand that natural gas supply to France could be high or low and that French government control could stay as it was or be liberalized. Merely quantifying four Quadrants of Uncertainty didn't make for any gain in insight. The simple array of obvious uncertainties was a kind of trap: the way out would appear to be those already obvious solutions (in terms of strategies) which were often simplistic and unreconcilable--hardly a recommendation for such a time-consuming planning process!

But we intuited--we hadn't yet learned it--that we had discovered a useful search tool. By carefully studying certain of the elements suggested by this matrix design, the deeper understanding gained of the interplay of factors can lead, paradoxically, to the finding of some certainties, some inevitabilities amid the complexities of the situation. We began to appreciate the importance of additional sorting out of "PREDETERMINED elements" and "UNCERTAINTIES." In emphasizing only uncertainties, and only obvious ones at that, the scenarios we had developed were merely "first generation scenarios." They were useful in gaining more understanding of the situation so as to ask better questions and develop better "second generation scenarios" later--that is "decision-scenarios." This dawning intuition--confirmed by all later experience--was an awareness of the critical importance of design. Scenarios will either help the decision maker, or be of little use to him, depending on how they are constructed and presented, not just on the information they contain. It is like architects who can create a well- or

poorly designed building, even though both use all the same materials of construction.

Although the initial attempt at scenario planning was not a success, it whetted our appetites. We believed the technique had promise and wanted to continue using it to experiment with second-generation scenarios.

Horizon sees discontinuity ahead. Meanwhile, the Horizon Year exercise fully confirmed the conclusions of the Year-2000 Study. The most important ones were:

- The oil market—which had long been characterized by oversupply—was due to switch to a sellers' market.
- Soon there would be virtually no spare crude oil supply capacity in the secure, stable areas such as North America.
- Inevitably the Middle East, and in particular the Arabian Gulf, would be the balancing source of oil supply. In order to satisfy estimated world demand for crude oil, some 53MM B/D would be required from this region by 1985, compared to only 14MM B/D in 1970. (And this forecast allowed for discovery rates outside the Middle East some 40 percent higher than those achieved during the 1960s.)
- The very high demand on Middle East production would bring a sharp reduction in the Middle East reserve-to-production ratio.
- It seemed likely that this very sharp peaking in Middle East production would not in fact be allowed to occur and that many other factors would intervene, including:
  - (a) A desire by Arab countries to extend the lifetime of their one valuable resource.
  - (b) A cornering of the world energy market by Gulf producers for perhaps ten to fifteen years by limiting production.
- Something approaching a sustained worldwide depression would be necessary to reduce the growth of demand for Middle East oil to levels where the anticipated sellers' market would be too weak to command substantially higher oil prices.

All of these developments would clearly have a major impact on the oil industry; yet in the Shell world, it was business as usual. (For example, some long-term contracts to supply products continued to be made at fixed prices—as if the fundamental changes projected by the Horizon Study would apply only on some other planet.

After the Horizon Study was presented, serious doubts were raised about the the UPM system's ability to provide realistic assumptions for the planning process: "How could it provide the 'right' answer if the forecasts on which it is based were likely to be wrong?" In 1971, therefore, it was decided to try scenario planning as potentially a better framework for thinking about the future than forecasts—which were now perceived as a dangerous substitute for real thinking in times of uncertainty and potential discontinuity. But Shell, like many very large organizations, is a cautious company. During the first year, when scenario analysis was done on an experimental basis, the UPM system continued in operation throughout the company. In 1972, scenario planning was extended to Central Offices and certain large Shell national operating companies. In the following year, it was finally recommended throughout the group and UPM was then phased out.

Learning Scenarios

Our next task at Shell was to find out how to go from a first-generation type of scenario to one that could become the basis for action. Somewhat to our surprise, we have found it always a useful starting point to construct what we term, a "surprise-free" scenario or a "consensus-forecast." The surprise-free scenario is built on the implicit

views of the future shared by most managers. While it is often the least likely outcome, its inclusion enables them to recognize their outlook in the scenario package. It is their entry--their bridge--into the future: without the surprise-free scenario, all possibilities may appear alien to the managers and they may reject the process out-of-hand.

The 1971 First Generation Scenarios

The Horizon Planning exercise indicated that the existing rate of growth for oil demand couldn't continue indefinitely; some break would have to come before 1985. Accordingly, 1985 was chosen as the horizon for the 1971 scenarios. Another significant date would be 1976, because the Teheran Agreement of 1971 (which established the level of oil producer-government taxes for OPEC) was to be renegotiated at the end of 1975.

Four scenarios were then constructed (Chart III).

Chart III

1971 Scenarios

I	II	III	IV
Surprise-free Scenario	High Govt. Take Lower Demand	Very Low Demand Lower Govt. Take	Other Energy-Intensive Scenario

Scenario I: A surprise-free, consensus scenario virtually lifted from the concurrent UPM work It assumed median economic growth and led to an estimate of free world energy demand in 1985 of 154MM B/D oil-equivalent. While this was slightly higher than the 1971 UPM estimate of 150MM B/D, it fitted well with managers' expectations at the time.

because the UPM had been consistently underestimating energy demand. (For orientation, 1971 free world energy demand was 78MM B/D).

Scenario II: Postulated a great increase—a tripling—of host-government tax take on the occasion of the renegotiation of the Teheran Agreement at the end of 1975, and further increases later. These assumptions of much higher oil price would result in lower economic growth and energy and oil demand levels than those seen in the surprise-free scenario.

Scenario III: Treated the other obvious uncertainty: very low growth. Based on the recession years of 1970 and 1971, and a proliferation of already evident "me-first" and nonwork-oriented values, this slow-growth scenario premised an economic growth rate only half that under Scenario I. International trade would also slow down due to the lower growth and because the same attitudes would manifest themselves as nationalism and protective tariffs. Low oil demand would limit any oil price rises, and producer government take would increase less than in the surprise-free scenario.

Scenario IV: Postulated that demand for coal and nuclear energy would grow at much increased rates, mainly at the expense of oil. Other premises were kept similar to those in the surprise-free scenario.

All four of the scenarios assumed that the tax take of the producer governments would be increased at the Teheran renegotiation scheduled for the end of 1975. The assumptions are depicted in Chart IV.

The range of free-world energy and oil demand in 1985 for the four scenarios was:

Scenario	MM B/D Oil-Equivalents I	IV	II	III
Total 1985 Energy Demand	154	154	141	120
Supplied By				
Oil	87	75	63	56
Coal/Nuclear	36	47	47	35
Hydro/Natural Gas	31	32	31	29

As is evident, the range of estimated energy demand was fairly wide, from 120 to 154MM B/D. The range of oil demand was even wider, at 56 to 87MM B/D.

This set of scenarios seemed reasonably well designed, and would fit most definitions of what scenarios should be. It covered a wide span of possible futures and each scenario was internally consistent.

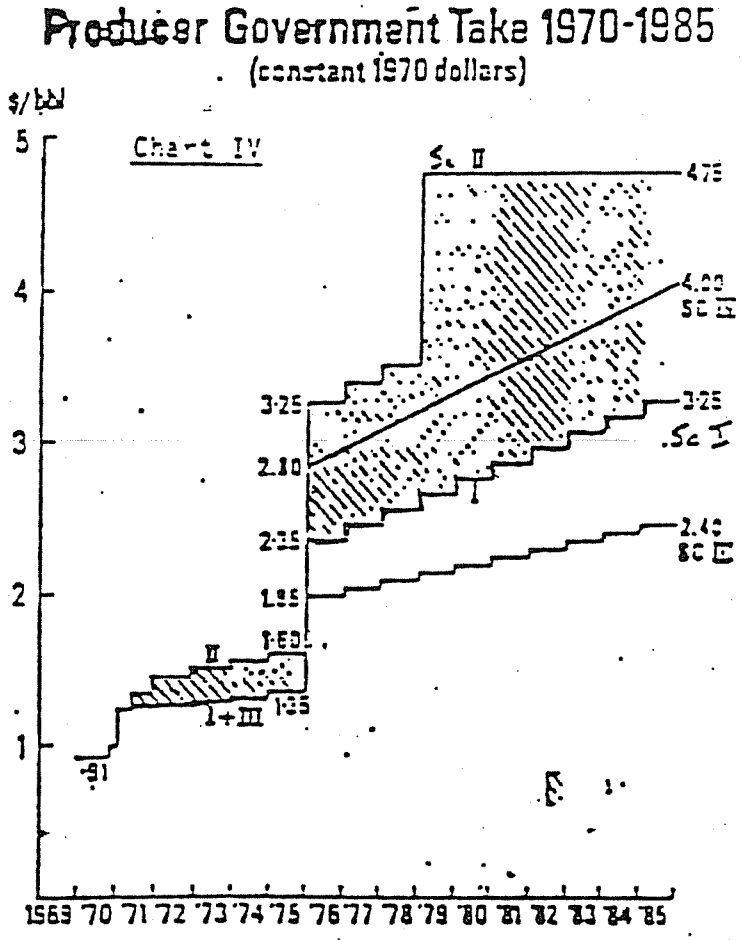
When it was presented to Shell's top management, the problem was the same as with the French scenarios: no strategic thinking, or action could be taken from considering this material. True, we now had useful quantifications of the obvious uncertainties, and were sure that the range of uncertainties then considered relevant was reasonably well covered. But the scenarios were still useless for decision making.

It is this point which many companies reach in their efforts to use scenario planning, where the reaction of management must be similar: "So what! What do I do with these scenarios?" Many companies then abandon scenarios as useless—and indeed those are.

And yet this group of Shell managers was highly experienced in dealing with risk and uncertainty. For example, many of the decisions they take deal with exploratory drilling, a true uncertainty since you never know what is there until you drill. They are used to deciding whether to risk $5 million or over $50 million on exploration projects, and even to

Chart IV

Producer Government Take 1970–1985
(constant 1970 dollars)



distinguish between these risks, say in Brazil or the North Sea. What was so different about the uncertainties of scenarios? Quite simply, they needed structuring. In oil exploration, there were theories to call on, concepts to use, an organized body of geological and geophysical analyses, comparisons with similar geological structures, ways to spread the risk that were very familiar to the decision maker. Here, we had just presented the raw uncertainties. Our managers had no basis on which to exercise their judgment. The task for us was to devise ways to help them understand the nature of <u>these</u> uncertainties and to structure ways they could come to grips with them.

What, in time, we came to learn was that these first-generation scenarios are always learning scenarios; their purpose is not action, but to gain understanding and insight. The first-generation scenarios map out the future context. With that done and some of the predetermined elements identified, you then push to find others not obviously predetermined. The aim is to perceive more clearly the connections between various forces and events driving the system, and this understanding of the interrelatedness of the system shows that some apparent "uncertainties" are really "predetermined." In this way, we learned of many outcomes that were simply not possible under any reasonable set of assumptions.

Thus, our exploratory scenarios became good search tools. They had yet to become effective planning devices, but without them we would have been unable to develop the next generation of scenarios.

Expanding the Predetermineds

The Triangle Study

Our next step at Shell was to look more closely at the principal actors in our business environment: the OIL PRODUCER COUNTRIES, the OIL CONSUMING COUNTRIES, and the OIL COMPANIES (see Chart V). The roles they would play would be determined largely by their overriding concerns as producers, consumers and commercial interests; but there would be very significant differences in behavior within each group. We undertook the Triangle Study to understand better the characters in the drama and the behavior they would unconsciously be compelled to display when the discontinuity we saw ahead began to unfold.

Producer countries. We analyzed the major oil-producing countries one by one—not just OPEC and non-OPEC producers as groups—to try to determine their interests. As we did so, we saw that Iran's interests would differ from those of Saudi Arabia or Nigeria, and we expected that their strategies would show corresponding differences.

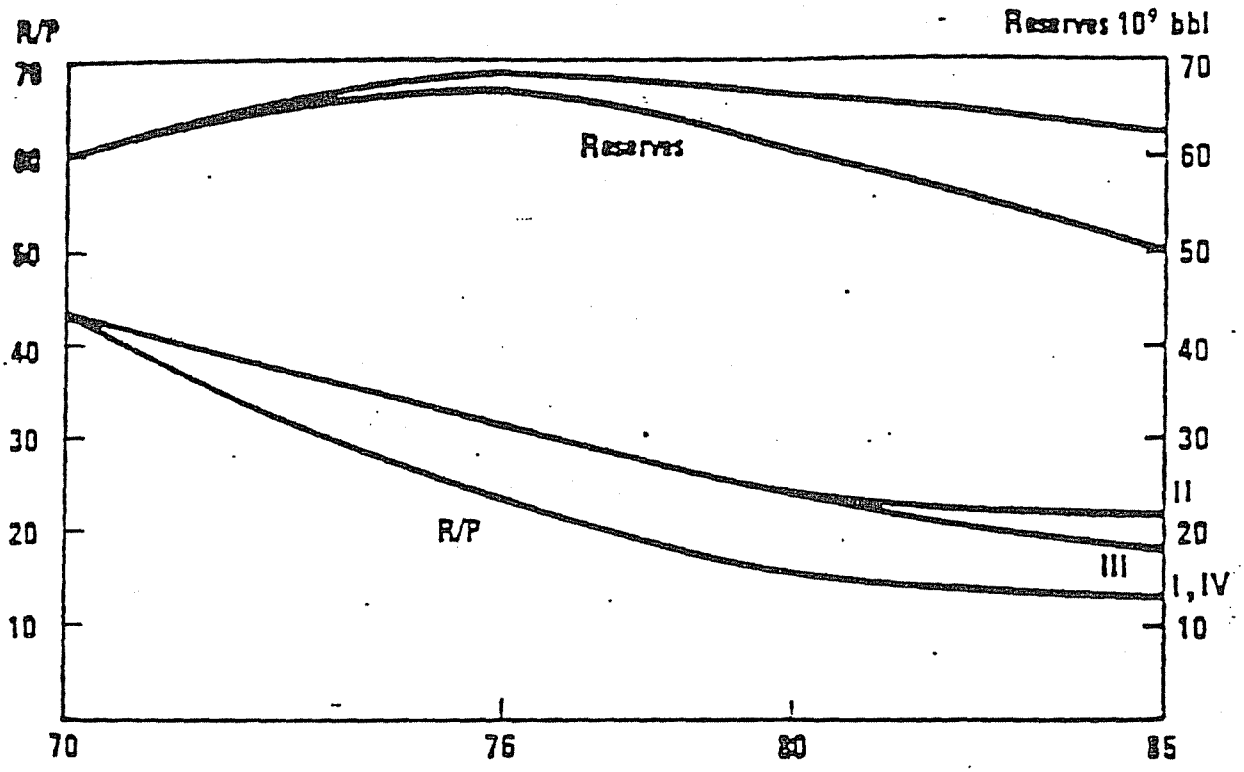
Our analysis of Iran is shown in the two panels of Chart V.

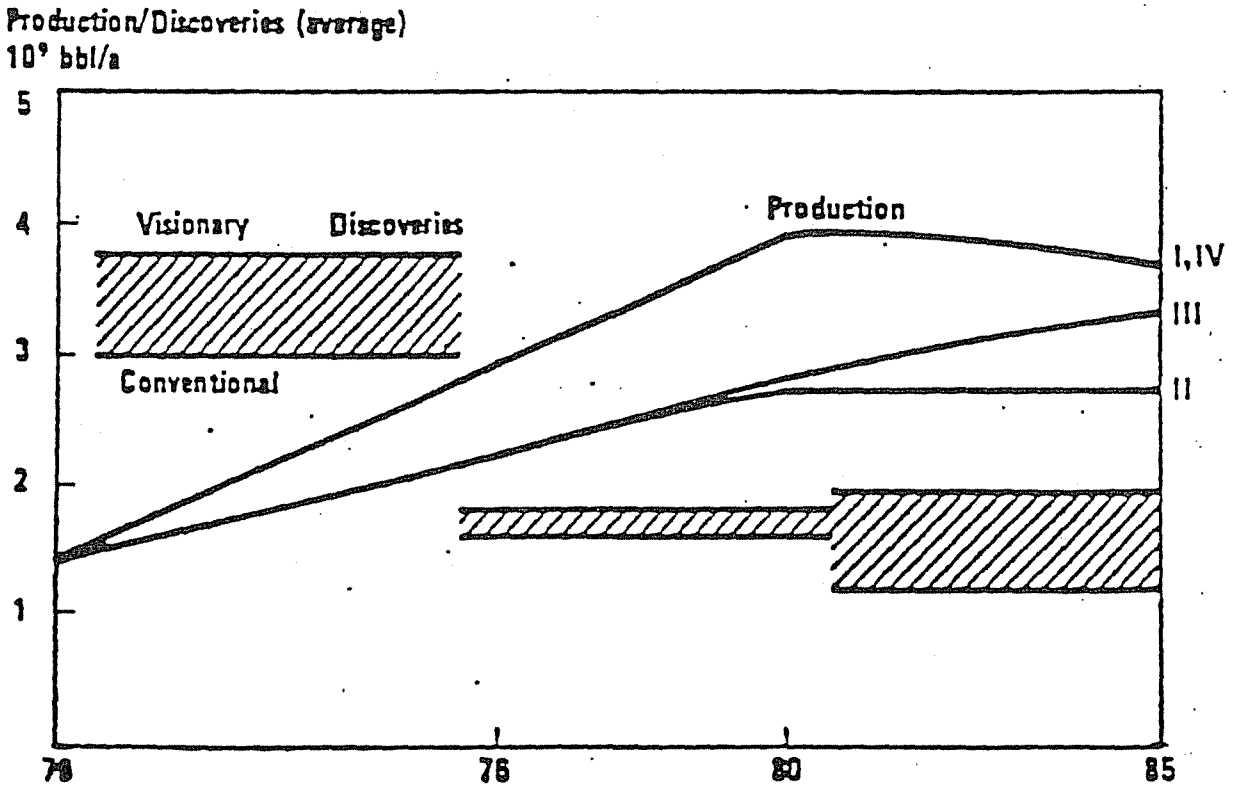
In the lower panel, Iran's oil production, as its share of projected oil demand under in the four scenarios just described, is shown. We had expectations, too, about Iran's discovery rates and additions to reserves (the shaded areas in the lower panel indicate the range). For the

Chart V

IRAN

RESERVES/DISCOVERIES/PRODUCTION





first five years, we expected the industry to find more new oil than Iran would be producing under any of our four scenarios and, hence, reserves would grow. For the second five years, the reverse would be true and reserves would fall.

Reserve/Production ratios would be dropping rapidly in all scenarios (upper panel). This, we felt, would be viewed with considerable alarm, since it could signal the virtual ending of Iran's oil export capability by the end of the century. Our conclusion was that Iran would strive to change its oil policy from one of expanding production to one of increasing price and possibly curbing production. This change in policy would stem not from any anti-Western attitude, but simply from the logic of national interest inherent in the situation. If we were Iranian, we would behave the same.

The Saudi Arabian situation appeared to be very different. Its production under the four scenarios (lower panel of Chart VI) would lead to the revenues shown in the upper panel. All scenarios except the gloomy, low-growth III, called for production levels that would generate much more revenue than Saudi Arabia could spend in purposeful ways (Absorptive Capacity). Even allowing for some of the surplus to be "manageable" doesn't change the basic outcome. Note especially that the surprise-free scenario had the Saudis producing 20MM B/D by 1985—what might be termed an oil-company logic but politically an outcome difficult to believe. Production levels sufficient to meet the national revenue needs are spotted on the lower panel in red.

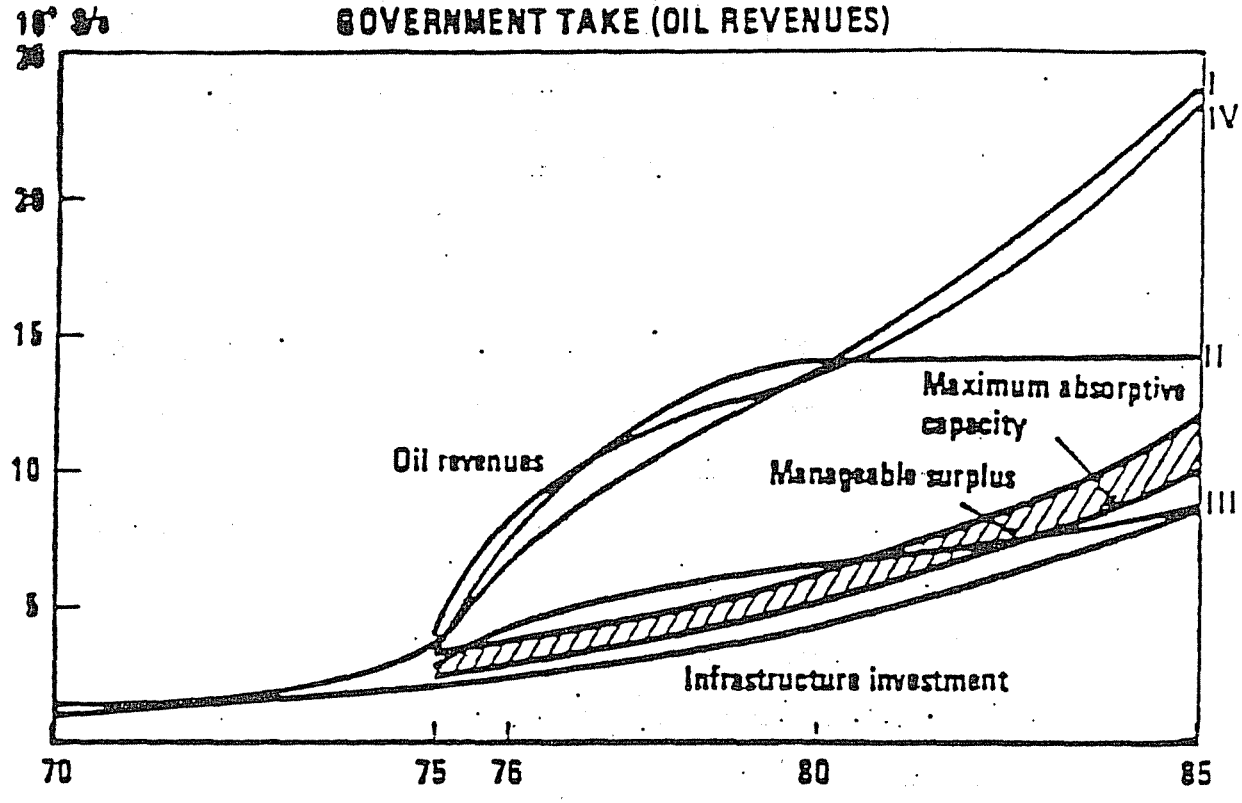
Our conclusion was that Saudi-logic would have to prevail over oil-company logic. Accordingly, we were not too surprised when Sheik Zhaki Ahmed Yamani, Saudi Arabia's Minister for Oil Affairs, later said:

Chart VI

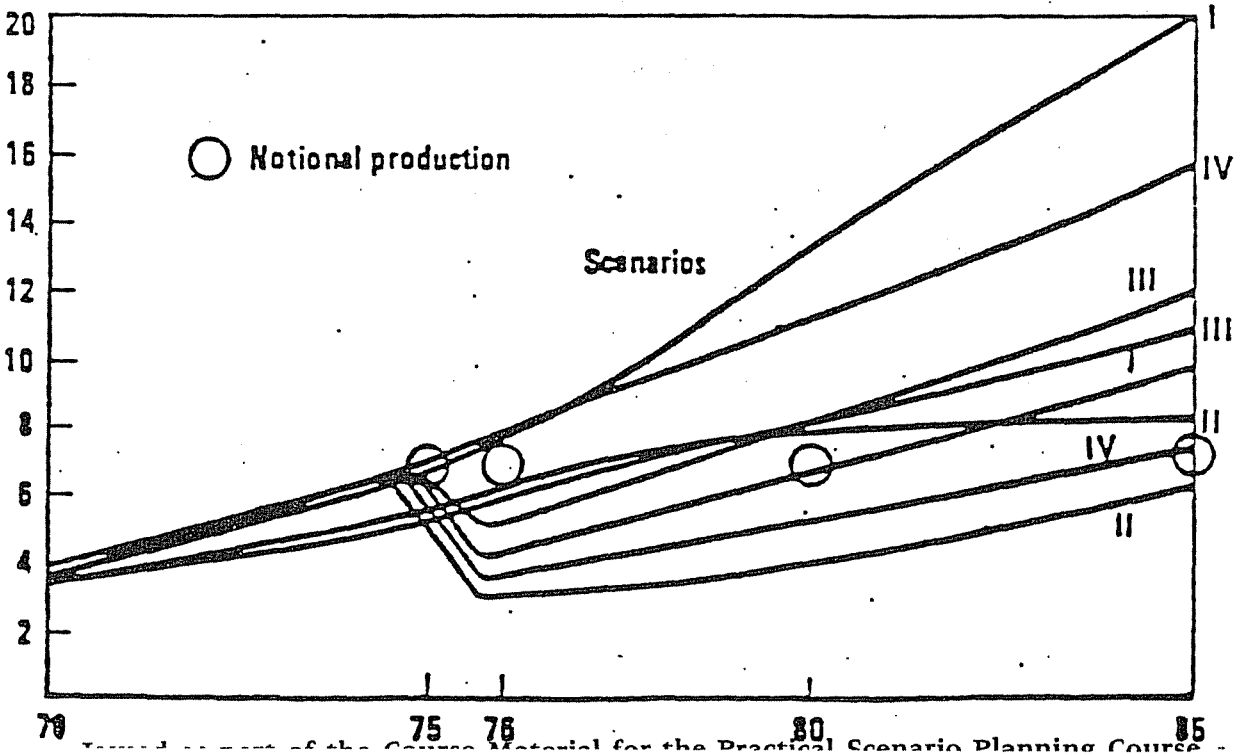
SAUDI ARABIA

(Incl. 50% N. Zone)

MAXIMUM ABSORPTIVE CAPACITY
INFRASTRUCTURE INVESTMENT POSSIBILITIES
GOVERNMENT TAKE (OIL REVENUES)



PRODUCTION LEVELS FOLLOWING FROM
SCENARIOS AND MAXIMUM ABSORPTIVE CAPACITY



> Inability to spend our surplus income inside our own countries will lead us to reconsider the value of keeping our revenues in the banks and realizing interest on them as compared with the appreciation in the value of our crude oil if it were to be left in the ground. We should find that leaving our crude in the ground is by far more profitable than depositing our money in the banks, particularly if we take into account the periodic devaluation of many of the currencies. This reassessment would lead us to adopt a production program that ensures that we get revenues which are adequate for our real needs.
>
> Platt's Oilgram, 10 Feb. 1972

Each of the producer countries could be analyzed in the same way, according to their oil reserves and their need for and ability to spend their oil income productively. When arrayed in the simple matrix of Chart VII, the power that was to become OPEC emerged clearly: no nation had both ample reserves and ample absorptive capacity; the fourth quadrant is empty. If an Indonesia, with its 150 million people and enormous need for funds, had the reserves of Saudi Arabia, the surprise-free scenario might have been on. But such was not the case. (Some day, the Soviet Union might find a place in the fourth quadrant—but at a much higher price than the 1971 level, since most of Soviet potential oil was expected to be very costly to develop.)

Consuming countries could also be expected to behave in different ways, depending on their circumstances, when the discontinuity crisis would come. Oil import growth was already a well-established phenomenon, with imports rising annually during the late 1950s and 1960s by about 1MM B/D, and then in the late 1960s at 2MM B/D (Chart VIII). But now, growth in consuming countries' imports was forecast to jump to 3-4MM B/D per annum, under the "surprise-free" scenario.

Chart VII
The Major Oil Exporters

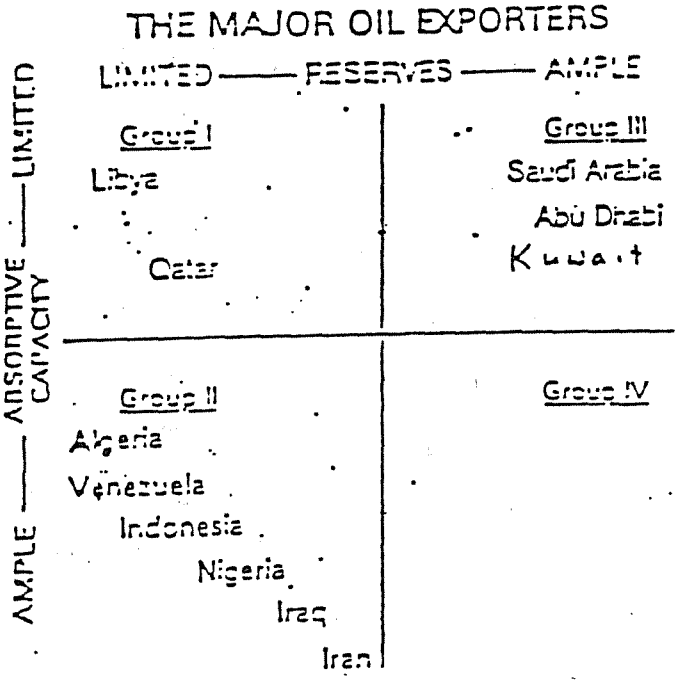
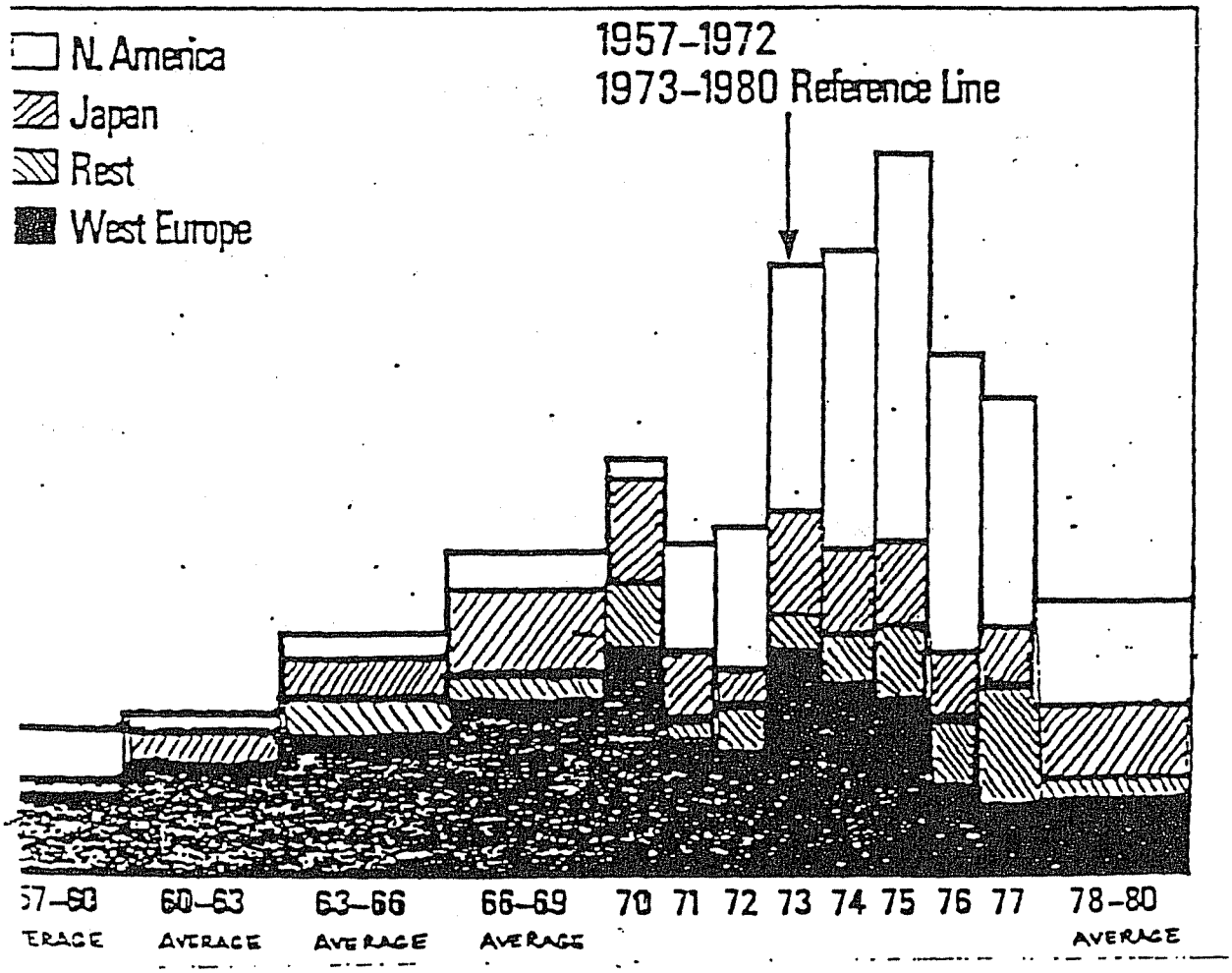


Chart VIII
Annual Growth in Import Requirements

/d



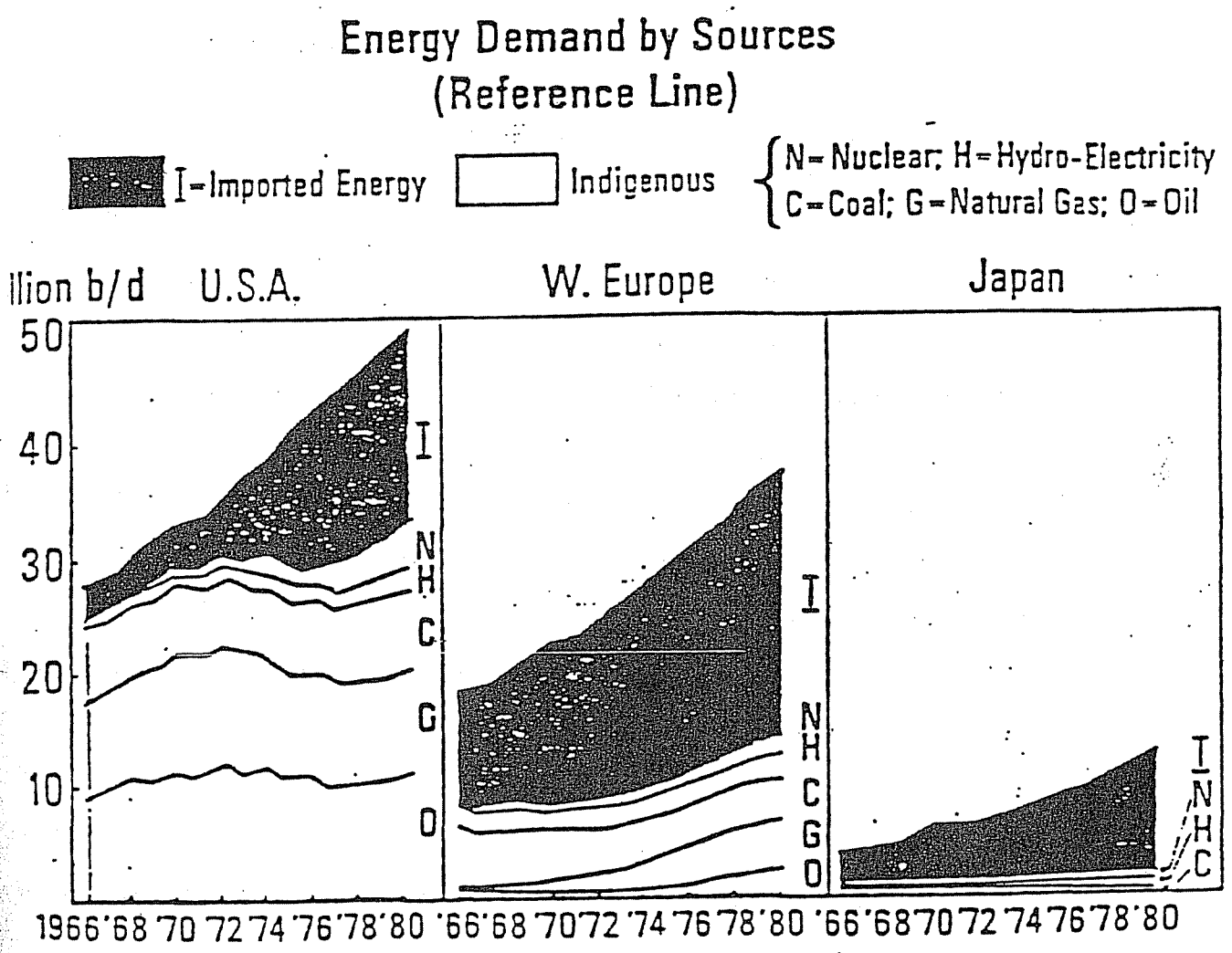
Different reasons for the jump could be ascribed to the U.S., Europe and Japan. In the U.S., domestic oil production had recently peaked, and now imported oil not only had to match demand growth but falling domestic production as well. Natural gas was not able to take up the slack because regulated price had discouraged its supply and its production was also in decline. Coal production could have been readily increased, but its use discouraged by environmental concerns, by ample availability of cheap imported fuel oil and by nuclear power's perceived future in electricity generation. Because of the large demand base in the U.S., when a 3%-4% increase in energy demand had to be met solely by imported oil, the U.S. share of oil import growth alone was more than 1MM B/D.

In Japan--which was then like a new continent emerging on the world economic map--the phenomenon was somewhat different. In 1953, at the end of U.S. occupation, Japanese industrial production was 40% of the U.K.'s; in 1970, it was more than double. The country was growing at 11 to 12 percent a year, with oil demand growing at times by 20 percent a year. This large oil dependency, combined with Japan's rapidly growing economic size, created huge increases in the nation's oil imports.

Insight and "soft" information were as important to us as these quantifiable data. For example, the Japanese always become anxious when there is any risk of critical imports being denied them. Their psyche would be particularly tested about any tension over oil supply. Furthermore, they would project onto multinational oil companies the type of behavior their own companies would normally display in a crisis situation being loyal only to the home country and ignoring the rest of the world. This would add to the probable overreaction to tension over oil supplies.

Oil import growth projected for the U.S., Japan, and West Europe is shown in Chart IX.

Chart IX



We also did a number of other analyses aimed at increasing our understanding, expanding the PREDETERMINEDS and striving to get to the core of the UNCERTAINS. We looked at:

- Oil Demand by Class of Market and How It Might Grow at Differing Rates.
- Implications of High Oil Price on Country Balances-of-Payments and Inflation.

- Inter-Fuel Competition and How This Might be Changed by Higher Oil Price.
- Changing "cut of the Barrel" (the yield of gasoline and light fuels versus heavy fuel) as Driven by Changing Inter-Fuel Pricing.
- Possible Reactions of Consumer Governments to Higher Oil Price (Free Markets vs. Dirigism).
- Construction, Already Committed to, in Refinery, Marine and Market Facilities.

With all of these "building blocks," we were beginning to understand the forces driving the system. Could we now tackle the 1971 scenarios again and devise a set of scenarios that would catch the decision maker's attention, and help him cope with the coming discontinuity and focus usefully on its uncertainties? We now felt we could design scenarios that might provide a proper framework for decision making, but we realized that we would have a formidable communications task.

The 1972 Scenarios

In September 1972, we presented to Shell's top management an array of possible futures, gathered in two families, A and B. All of our analyses had pointed with great likelihood to the early surfacing of a major discontinuity, namely, the impending scarcity of oil and an ensuing sharp increase in its price. What appeared "uncertain" was its timing (although it couldn't be too many years away) and, more particularly, how different actors would respond to it.

The A-family of scenarios postulated the discontinuity and then examined three ways in which circumstances might develop:

A1 would be a private-enterprise solution to the emerging energy shortage;

A2 would have governments intervene to solve the problem, the dirigiste solution;

A3 presupposed that solutions would not be found early enough, and an energy crisis would result.

The A-family scenarios fixed the timing of the discontinuity at the end of 1975, coincident with the scheduled renegotiation of the Teheran price agreement. (In reality, the discontinuity came in the fall of 1973—not yet caused by demand outrunning supply, but when the oil embargo was imposed after the outbreak of the Israeli/Arab war in reaction to U.S. assistance to Israel.)

Moderate economic growth was assumed through 1976, with growth thereafter threatened by a possible scarcity of energy. Most oil-producing countries would be reaching the technical limit of their capacities by 1976, while the others would be reluctant to increase output further due to their inability to absorb the additional revenues. Accordingly, producer countries oil prices would increase substantially at the end of 1975. Consuming countries, confronted with the possibility of physical shortages of energy supplies and with greatly increased oil import bills, would experience shock waves.

The essential point in the A-family of scenarios was discontinuity. Shell would have to prepare for a sudden change in the behavior of both producing and consuming countries that would result from their awareness of an impending imbalance between demand and supply of oil. The discontinuity might arise from a situation of tension, created by the producing countries' imposing a limit on the amount of oil they produced. It might also come about if these nations announced a gradual decrease in the rate of production growth, or if they gave advance notice of such a policy. In any case, the awareness of an impending energy gap constituted only the first stage of the process. The most important consideration, it

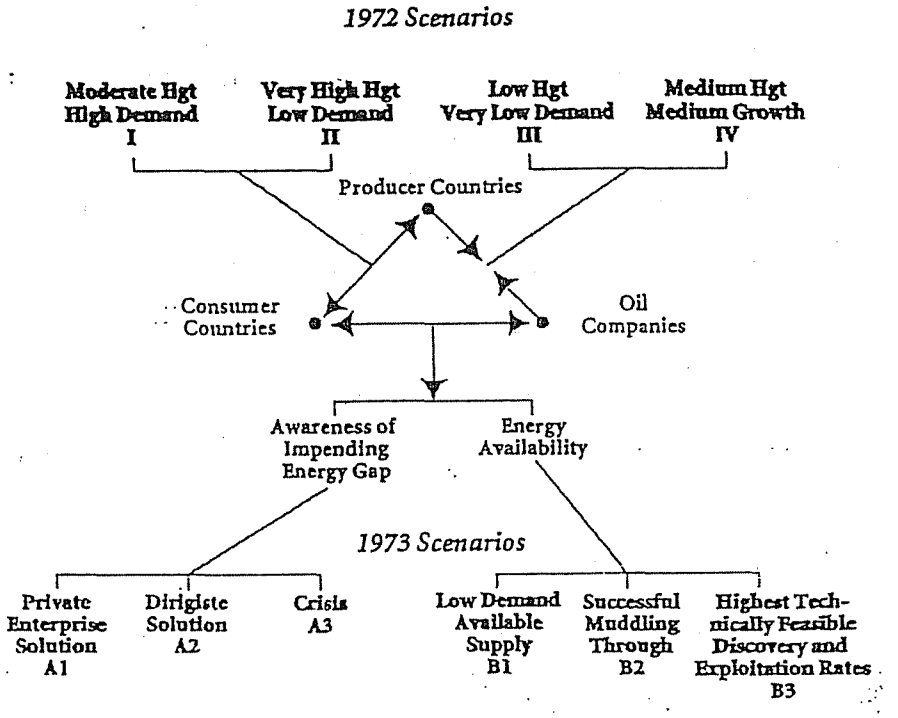
was felt, was the timing and direction of the active responses to such awareness.

The A-family of scenarios emerged as the most likely outcomes from our analyses, but they were at sharp variance with the implicit "world view" then prevailing in Shell. That view was one of EXPLORE AND DRILL, BUILD REFINERIES, ORDER TANKERS, EXPAND MARKETS. But how could we be heard?

We therefore created a set of "challenge scenarios," the B-family. Here, the basic premise was that somehow, sufficient energy supply would be available, and as discontinuity of energy supply would appear. These three scenarios would serve not only to challenge the assumptions underlying the A-family scenarios, but could also destroy many of the more comfortable business-as-usual aspects of the "world view" so many in Shell were still operating by.

The A-family and B-family scenarios could then be shown as either alternative responses to different outcomes (Chart X-A) or different paths pursued into the structure (Chart X-B).

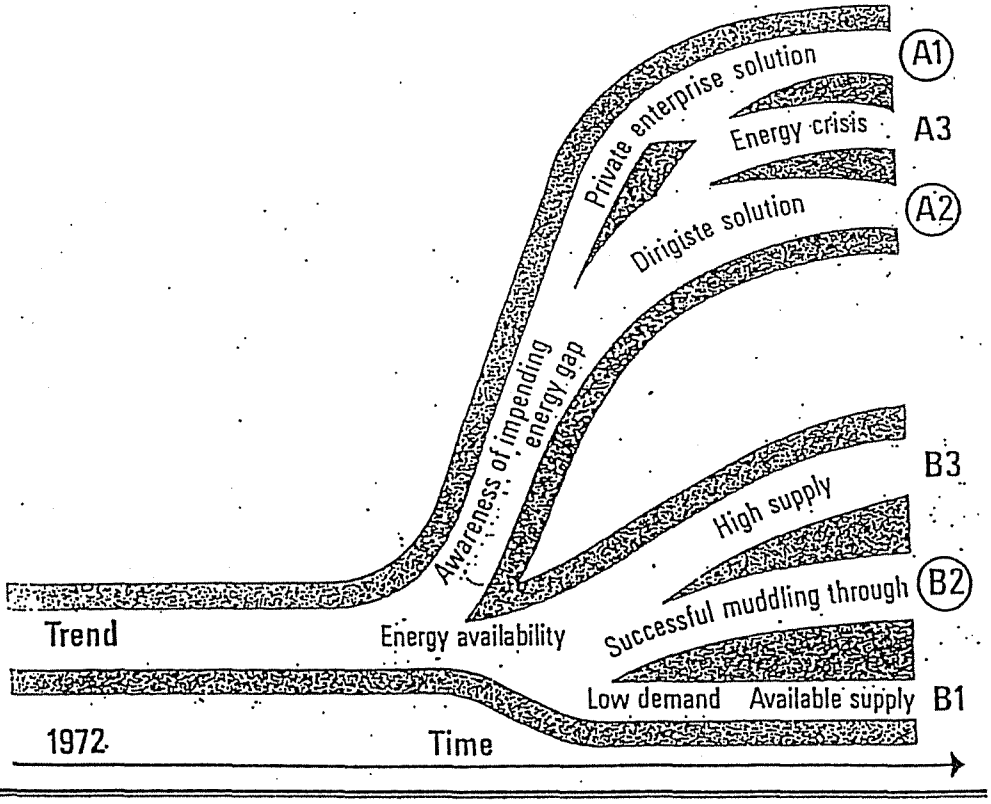
1973 Royal Dutch/Shell Scenarios



(91) IC 2 Source: "Scenarios for 1973 Planning Cycle," Group Planning, Royal Dutch/Shell, January 1973

GBN Global Business Network

1972 Scenarios



GBN Global Business Network

This might be a useful point to remark parenthetically about two aspects of scenarios that we learned only later. Six scenarios are far too many. The ideal number is two, which highlight the principal uncertainty being focused on, plus the consensus or surprise-free scenario.

Another insight later gained was the importance of naming the scenarios. A well-chosen name conveys to the decision maker the essence of what drives the scenario; it also reduces the detail you must provide him and not only encourages him to fill in the detail (making the scenario alive for him) but leaves him room to do so.

The B-family of scenarios. With hindsight, the critical assumption of discontinuity for the A-scenarios looks rather obvious. At the time, however, it was seen as quite the reverse. We believed in the A-scenarios, we put them forward very strongly as the most likely direction of events. But they did represent a major revolution in thinking for an oil company--and many Shell managers (like their counterparts in other companies) still wanted to believe in futures without discontinuity.

The B-family of scenarios therefore described how discontinuity might be avoided.

B1, was a protracted low-economic-growth scenario, requiring at least 10 years of low growth to force a demand fit to the oil supply presumed available. While low growth had seemed plausible in the downturn of 1971, by 1972 we could see signs of a coming economic boom. We did not know, of course, the extent of this period of above-average growth, or that growth in 1973 would be the most spectacular since the Korean War. But we could already see that our low-growth scenario, B1, was extremely unlikely: it would require an immediate and sharp drop in the growth rate of the world economy, which we had no reason to anticipate. Moreover, the negative cultural trends of the late 1960s in industrial countries were waning. Governments and the public perceived that rising unemployment was

a problem and were consciously seeking growth. So, the B1 scenario, premising very low growth for a long period, had low credibility. However, it performed its function of highlighting the major discontinuity most effectively, simply because it was not a likely way to avoid the discontinuity.

B3, a more important alternative, postulated a very high supply of oil. We called it the "three miracle" scenario, because it required three extremely unlikely situations simultaneously. First, it required an exploration and production miracle. Our original surprise-free scenario had predicted a certain level of demand for oil. To meet that demand, rapid development of Middle Eastern reserves and extensive new discoveries were necessary. Our Exploration and Production staff believed that there was a 30 percent likelihood of finding the necessary reserves in each of the oil provinces individually, but that there was only a very small percent chance of finding the necessary reserves in all the areas. Meeting the forecast 1985 demand would require not only 24MM B/D from Saudi Arabia, but also 13MM B/D from Africa and 6MM B/D from Alaska and Canada. Many new discoveries would be needed for these figures to become reality.

The second miracle demanded by the B3 scenario was a sociopolitical one: all major producing countries would be happy to deplete their resources at the will of the consumer. Countries with low absorptive capacities would agree to produce huge amounts of oil and put their money in the bank, exposed to erosion by inflation, rather than keep their oil in the ground for future generations. This scenario projected onto the oil-producing countries the values of consuming countries—a kind of Western cultural imperialism that was extremely unconvincing once examined rationally.

The final miracle of B3 started with the recognition that there would be little, if any, spare capacity over projected demand under the high-supply scenario. Previously when minor crises developed in the Middle East, there had always been additional oil available to meet sudden, short-term needs. (For instance, in 1956 during the Suez crisis, Texas and Louisiana helped out with their spare capacity. Similarly, during the June 1967 Middle East conflict, Iran called on its spare capacity to meet consumers' needs.) Under Scenario B3 there would be no spare production capacity. The miracle, then, was that there would be no need for it--no wars in the region, no acts of God, no cyclical peaks of demand higher than anticipated. Again, nothing short of miraculous.

The B3 scenario also performed its function very well by demonstrating that the high-supply assumption was extremely unlikely. Its essential role was educational.

B2, a totally artificial construct, was a middle-of-the-road scenario premising that despite all the problems, a muddling-through approach could be more or less successful. A widespread sentiment, particularly among Anglo-Saxon managers, is well expressed by William Ogburn: "There is much stability in society . . . social trends seldom change their directions quickly and sharply . . . revolutions are rare and evolution is the rule." We couldn't really justify this scenario, but we knew that the worst outcome is not always the one that develops, and we imagined a situation in which the most positive outcomes were the norm. Oil-producing countries would take a live-and-let-live approach in order to obtain military and other concessions. Consuming countries, with great foresight, would take immediate steps to curb the rapid growth of oil consumption by encouraging energy saving.

The great danger was that the B-2 scenario coincided with the best estimates for oil demand by the major operating companies. It was thus a surprise-free environment as long as we did not probe too deeply into current forces. As soon as we did any serious digging into what underlay this scenario, it became much less convincing.

Both the A- and B-family scenarios were fully quantified in terms of volumes, prices, and their impact on individual oil producing and consuming countries as well as on interfuel competition in different markets. Our presentation of them succeeded in gaining the attention of top management principally because the B-family of scenarios destroyed the ground any of them may have chosen to stand on.

Two decisions were then taken

- to use scenario planning in the central offices and the larger of the operating companies, and
- to advise informally governments of oil-consuming countries about what we saw coming.

To implement the first decision, Shell asked its major, downstream operating companies to evaluate their current strategies against two A-type scenarios, using the B-2 scenario as a sensitivity check. A series of oral presentations was also made to the governments of the major consuming countries, starting in October 1972, followed by the distribution in May 1973 of a brochure, "The Impact on the World Economy of the Market for Oil." The brochure was based on a single scenario which stressed discontinuity, and traced its effects on oil-consuming countries' balance of payments, rates of inflation, resource allocation and so on.

Within Shell, the next step was to present the A and B scenarios to the second echelon of management. For most of them, it was their first exposure to scenarios. The meeting was in stark contrast to the

traditional UPM meetings which dealt with forecasts and trends and premises--all with an avalanche of numbers. Scenarios focused less on outcomes and more on understanding of the forces that would compel the outcome; less on figures, and more on insight. This meeting was positive and unusually lengthy, and the audience clearly appreciative. We thought we had won over a large share of them.

In reality, the following months would show that no more than a third of Shell's critical decision centers were really acting on the insights gained through the scenarios, and actively preparing for the A-family of outcomes. The scenario package had created an intellectual interest, but it failed to change behavior in much of the Shell organization. For us, this came as a shock and compelled us to rethink how to design scenarios geared for decision making.

Reality was painful: most studies dealing with the future business environment, and now including these first scenarios, had a very low existential effectiveness. (We would define "existential effectiveness" as single-mindedness; but the Japanese express it much better—"When there is no break, not even the thickness of a hair, between a man's vision and his action.") A vacuum cleaner, for example, has an effectiveness of 30 to 40 percent; the rest is heat and noise. Future studies, particularly when they point to discontinuity, have an effectiveness below that of a vacuum cleaner.

If your role is to be a corporate look-out, and you clearly see a discontinuity on the horizon, you had better learn what makes the difference between a more or a less effective study. Here, we learned a lot just by watching.

One of the differences involves the basic psychology of decision making. Every decision maker has a mental model of the world in which he or she acts. The model is based on past experiences and on the information which have been internalized. When someone has a decision to make, he confronts alternative ways of behaving with his mental model. When it proved to be a good decision, others say he has good judgment. In fact, what he has is a mental map that largely matches the real world. We call this mental model or map the decision maker's "microcosm,"—the small model in the head--as opposed to the "macrocosm," which is the large, real world out there.

There is also a corporate view of the world, a corporate microcosm. During a sabbatical year in Japan, I became acutely aware, for example, that Nippon Steel was not "seeing" the steel market the same ways as Usinor, the French steel giant, and this led to marked differences in their behavior and priorities. Each had a view of the world and acted rationally, consistent with that view.

The perception a company has of its business environment is in fact as important as its infrastructure of investment, because the strategy the company adopts will be the product of this perception, of how it sees the world—<u>its</u> world.

I cannot overemphasize this point: unless the microcosm—individual or corporate—is changed, no change in behavior will occur; the internal compass must be recalibrated.

From this realization onward, we no longer saw our task as producing a documented view of the future business environment five or ten years ahead. Our real target was the microcosms of our decision makers: unless we influenced the mental image, the picture of reality of critical

decision makers, our scenarios would be like water on a stone. This was different and much, much more than producing a relevant scenario package.

Our initial aim had been to produce scenarios that we would not be ashamed of when subsequently confronted with the reality. From this point on, we wanted to design scenarios that would lead our decision makers to question their inner model of reality and change it as necessary, in order to take action they would not be ashamed of later. This was a fundamental change in perspective, as fundamental as when an organization switches from selling to marketing.

Impacting the Decision Maker

The 1973 Scenarios—The Rapids

"It was ordained at the beginning of the world that certain signs should prefigure certain events," Cicero noted twenty centuries ago. All the signs at the end of 1972 and early 1973, as we set about preparing the next set of scenarios, still pointed to that major oil discontinuity.

We had done new analyses that again told us that a very tight supply-demand relationship would exist during the coming decade. Even in 1973, '74 and '75 (before the anticipated renegotiation of the Teheran agreement), demand could be expected to push right up to available production capability. And that supply would already be stretched, since it predicated that certain countries, such as Saudi Arabia and Kuwait, would produce contrary to their logic.*

---

*The details of these new supply/demand studies needn't again be told here but are described in Pierre A. Wack, "Learning to Design Planning Scenarios." Harvard Business School Working Paper 1-785-006, pp. 26-30.

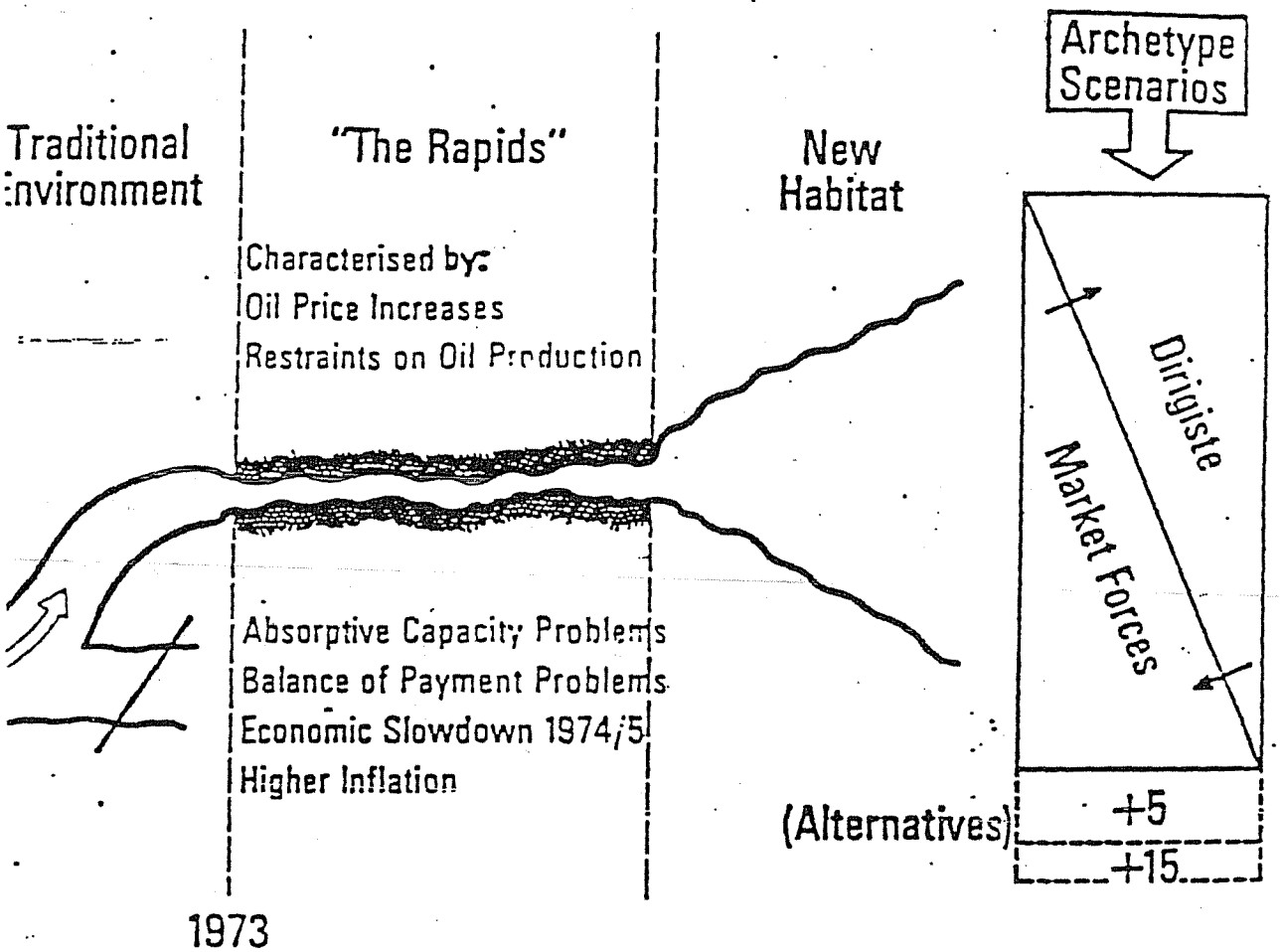
Now, we saw even discontinuity as totally PREDETERMINED. Prices, then, would rise rapidly, and oil production would be constrained, not because of a true shortage of oil, but for political reasons—taking advantage of the very tight supply-demand relationship. Discontinuity would thus be our surprise-free scenario. What was not known was how soon the discontinuity would occur, how much of a price increase there would be, and what the reactions of the various players would be. Our company was like the canoeist who hears the white water around the next bend, and now needs to prepare for "THE RAPIDS" he will soon have to negotiate.

To reframe the outlook of our managers, we portrayed the situation for the 1973 scenarios as in Chart XI. From the calm up-river of the TRADITIONAL ENVIRONMENT, we would be plunged into the turbulence of THE RAPIDS, and have to learn to live in a NEW HABITAT for oil producers, for oil consumers, and—especially our concern—for oil companies.

The alternate branch of the river (the B-challenge scenarios of 1972) had now been dammed off. The "No Growth-No-Problem" possibility (B-1) now seemed completely noncredible as economies, fully recovered from the recession of 1971, boomed. "Three miracles" (B-3) still seemed just that—three supply miracles. And from our discussions to warn governments about the impending crisis, we concluded that any reaction from governments would be after the event. (Obviously, we hadn't yet learned how to impact the microcosms of governments either!)

Another technique we used in the 1973 scenarios to keep the B-branch of the river dammed was to allow for delay in the onset of the discontinuity. In Phantom Scenario I, we assumed a delay of five years; in Phantom II, fifteen years. (These, respectively, were typical times for

Chart XI
1973 Scenarios



bringing a new oil facility into service and for its amortization.) What we sought with these phantom scenarios was to measure the "regret" we would experience if Shell planned for the discontinuity but it did not in fact occur during the phantom years.

In the booming economy of late 1972 and early '73—with growth exceeding any period since the Korean War, trade expanding at a record clip and oil consumption higher than even our bullish reference line--it was particularly difficult to convince an oil company having an affair with expansion that now was the time to slow down, to hold off on expanding refineries to stop building tankers and so forth.

And the phantom scenarios did measure a considerable "regret" if expansion continued and we didn't go with it. But, again, only two developments could delay the discontinuity, enabling business-as-usual to continue for any period of time; and both seemed so implausible that discontinuity soon had to be regarded as a PREDETERMINED. (The two situations allowing for a continuation of the existing pace of oil demand increase, and which were ruled out, were: the discover of new Middle East-size oil reserves in an area with no absorptive capacity problem; and, the dominance of producer countries by consuming countries through some sort of political or military intervention.) The phantom scenarios acted, therefore, to reinforce the unpalatable message we were sending.

More Than Water on a Stone

On the surface, the 1973 scenarios were much like the A-family of the 1972 group (see page facing p. 28) , but we saw them very differently. We were now driven by a sense of urgency. The time apparently available for an oil company to anticipate what the new habitat would be like, to prepare for it and to respond to it, had shrunk greatly. (Remember, too, we expected the crisis close to the Teheran renegotiation date at the end of 1975; we didn't forecast that the discontinuity would occur as early as the fall of 1973, on the occasion of that Arab/Israeli war and the Arab oil embargo.)

Perhaps even more important, we wanted to be more than water on a stone: How could we impact the view of reality--the mircrocosms—of decision makers? The easy part would be to destroy their existing view of the world (i.e., of orderly, predictable expansion of oil demand, a world of adding to oil fields and refineries and tankers and marketing outlets).

We had been at this job of destruction for several years, and by 1973--the first year scenarios were used without the UPM--we were not even allowing for the conventional possibility.

But exposing and invalidating an obsolete world view was just the necessary first step. Reconstructing the new inner model of reality would be the task of decision makers themselves. The planner's job is to help by engaging the decision maker's interest and participation in doing this, listening carefully to what he says he needs, and then to provide the highest quality materials for him to use. The planner will succeed, however, only if he can securely link the outside world, the business environment he scans, to the microcosm of the decision maker. Good scenarios provide this vital "bridge"; but it must be firmly anchored on both sides—it must deal with managers' real concerns, as well as external reality. Otherwise, there is a risk that no one will bother to cross the bridge.

If the "package" is well designed, a manager can then use the scenarios to construct a new model of reality by selecting those elements he believes are relevant to his business world, or, perhaps, what his "gut" tells him, or, perhaps, none of these things. After all, he is the decision maker and his track record has shown he is good at it.

What we later came to understand better is to make the scenarios relevant to the deepest concerns of the decision maker in the circumstances that he was facing. That requires knowing a lot more about the decision maker and his concerns than we knew then, or even suspected we needed to know. We did know that the scenarios would have to serve as a bridge to carry in the new elements and fashion the new microcosm. In later years, however, we built quite a few bridges that did not get used. The lack was

always a failure to design the scenarios so they were relevant to the deepest concerns of the decision makers. I will come back to this very important aspect of scenarios in the CONCLUSION.

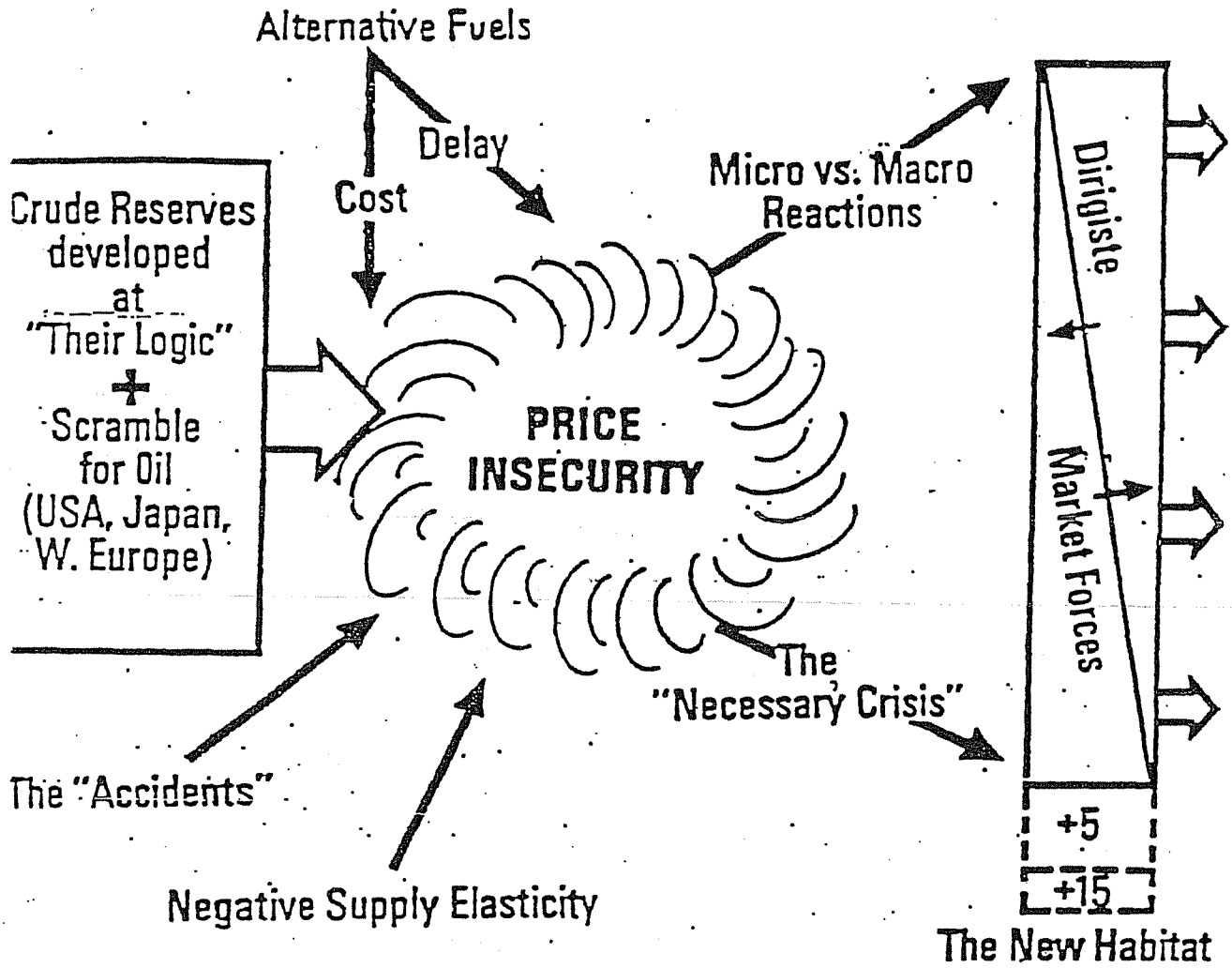
Building Blocks for New Microcosms

At the time, we realized that if decision makers were to reframe their microcosms quickly, they would need to have a clear overview of that new model of reality. Chart XII was one such attempt to provide a global view of the 1973 scenarios. It summarizes the business environment foreseen and its key elements. On the left, in the rectangle, are the PREDETERMINEDS—events which were already in the pipeline: the fact that oil reserves would soon be developed according to oil-producing countries' logic and that a scramble for oil would develop in this new sellers' market. In the center of the chart were the major discontinuities: PRICE INCREASE AND INSECURE SUPPLY.

Attention was focused on some singularities of the industry's business environment:

> Alternative Fuels could be developed only very slowly; none could be available before the 1980s, even under a wartime crash development program. The cost, moreover, needed analysis, and this was considered in three thresholds. First, other fuels might replace oil as "underboiler" fuel, that is, for power generation and for steam generation in large industrial settings; coal and nuclear energy were the competitive alternatives. It was clear that oil-producing nations would not be impressed by alternatives that replaced

Chart XII



their precious hydrocarbons in underboiler applications. On the contrary, they believed their oil was far too valuable for such uses and would welcome coal and nuclear power to displace oil in those low-value markets. The next threshold, oil used for heating, was the one that really counted. For such uses, burning coal as such would not be satisfactory: it would be necessary to gasify coal at great expense or to transform it into electricity, with the accompanying thermodynamic loss.

The price for this threshold, then, was very high, and we did not expect the oil price to exceed it in the near future. The third threshold, oil used in transport, was an even higher alternative fuel cost than the second, and therefore was not relevant to our analysis.

"Accidents" constituted another major and inevitable factor. In our terminology, accidents included internal and external political incidents as well as physical ones. Anyone familiar with the oil world considers such events likely. It is like the Filipino who knows that his roof must be built carefully; even though the weather in the Philippines is usually balmy, typhoons are frequent enough that the only uncertainty is when the strength of one's roof will be tested. So it would be with accidents in the world of oil, when there was no spare capacity in the system.

Negative Supply Elasticity would be another key element. Unlike other commodities, the supply of oil would not increase when its price rose, at least for a number of years. On the contrary, for major exporting countries, the higher the price the lower the volume of oil it would be in their national interest to produce. This reaction from major exporters would more than compensate for any increases in production by smaller exporters.

As planners at the center of a group of companies, we also faced a special problem. The message of our scenarios had to be useful for our managing directors, but it would also have to be of use to the operating

companies in Canada and Germany, in Japan and Australia. Yet the dramatic changes we anticipated would affect each and every nation differently. What basic message could be conveyed from the center that would be meaningful for managers in many diverse companies around the world?

We borrowed the concept of archetypes from human character analysis. Just as we are accustomed to viewing individuals as composites of archetypes (for example, introvert and extrovert, even though no individual is wholly one or the other), so we sought archetypes that would enable us to examine differing national responses to the coming upheavals.

In our view, nations would try to cope with this major discontinuity by either a market-force approach or by a government-intervention (dirigiste) approach. In their pure forms, these responses became our archetypes, and we explored each of them fully. We did not imagine that any country would follow either archetype absolutely, but we believed, for example, that West Germany's response would be heavily market-oriented, while that of its neighbor, France, would be more dirigiste. The actions anticipated under each archetypal response in terms of price increases, taxes, alternative fuels development, regulations, were analyzed by class of market.

Taking the Decision Maker to Water

We didn't yet fully understand that really impacting the decision maker required a tailor-made fit between the scenarios and the decision makers' deepest concerns. Intuitively, however, we knew in 1973 that events were giving us just this type of fit in several ways, and for Shell they were very deep and important. The arrows on the far-right sides of

Charts XI and XII symbolized four of the resultant implications we stressed to our decision makers.

We told our upstream people (those engaged in exploration and production), something nearly unthinkable for an oil company: "Be careful! You are about to lose the major part of your mining rents." This meant that the traditional base of profit in the upstream world would be lost--a revolutionary message for an oil company, and that new relationships had to be developed between the company and producing nations.

To the downstream world (the refiners, transporters, and marketers), we said something equally unthinkable, "You are about to become a low-growth industry." Again, this was revolutionary because oil demand had always grown more rapidly than GNP. Our management culture and its reflexes, were based on growth. In the past, the consequence of overinvestment was not too adverse; one or two years of normal market growth would cure any premature moves. Now we could expect that future consumption in industrial countries to increase less than GNP, which meant fewer new refineries, no new service stations and so forth. New instincts and reflexes would have to be developed to function in a low-growth world.

A third major implication was the need to decentralize further. We believed that one basic strategy could no longer be valid for operating companies in most parts of the world. It had been the strategy of Shell companies generally, for example, to aim for a higher share of conversion in refineries, and it had been quite successful. Now we saw that each nation would be affected so differently by the energy shock that each would have to respond independently. (Shell, which was already decentralized compared to other oil majors, did in fact, decentralize further, which enabled it to adjust faster to the turbulence experienced later. For

sometime now, it has in fact been the most decentralized of all the major oil companies.)

Finally, we alerted decision makers to the possibility that, since we didn't know when the discontinuity would come, we should prepare for it in different phases of the business cycle. We developed three simulations: in each we anticipated both a cyclical downturn and the expected oil discontinuity, but in differing relationships. In the first simulation, the oil shock occurred before the downturn; in the second, the events were simultaneous; and in the third, the oil shock followed the downturn. These simulations led Shell to prepare for a far more serious decline in economic activity than might otherwise have been expected.

. . .And Most Drank

The 1973 scenarios were a happy coincidence of the right material and the deepest concerns of decision makers. And if any were not yet fully convinced, the events of the fall of 1973 soon made them believers. We had set out not to produce a scenario booklet summarizing views but to impact the microcosm of the decision makers, to help them restructure their world view. Only now, however, did we appreciate the unique power of scenarios--which really becomes apparent in turbulent times, and has immense value in a large, decentralized organization.

Strategies are the product of a world view. When the world changes, there must be some common view of the new world throughout the group, or the decentralized strategic decisions that result could lead to anarchy. Scenarios provide a powerful way to express and communicate a common view of the new realities to all parts of the organization. Decentralized managements in operating companies worldwide thus have a

shared understanding which they can adapt and use for strategic decisions appropriate to their varying local circumstances. Their initiative is not limited by planning instructions dictated from the center, but all "speak the same language" in adapting to the changing business environment. Still companies from Finland to New Zealand now knew what "The Rapids" connoted, were alert to the implications of "Producer Logic," etc., and of the consequent need to prepare for a totally New Habitat.

We learn, from studying evolution, how an animal suited to one environment must adapt, must become a new animal to survive when the environment undergoes severe change. It was that sort of change we foresaw, and we believed that Shell would have to become a new animal to function in the new world. Business-as-usual decisions would no longer suffice. This element of the message was really our most important.

SCENARIOS: THE GENTLE ART OF RE-PERCEIVING (PART II)

Shooting the Rapids

Adrift in the Short-Term Economy

Most companies I have seen use scenarios for planning five to ten years ahead. For a variety of reasons, however, the application of the scenario technique to the short term is very interesting and can be particularly productive:

(1) You must, in any case, explore the short term in order to get to the long term; changes in the business environment over the next two or three years can have a major effect on the alternatives possible five or ten years ahead.

(2) Short-term scenarios can have a striking impact on the microcosm of decision makers because they are "immediate." Unlike long-term scenarios, they deal with events and information that are already part of managers' day-to-day concerns.

(3) They help to establish credibility--which is essential to the process--because their usefulness is quickly tested against reality; you don't have to wait five or ten years. In addition, managers tend to regard planners who deal only with the long term as mere theoreticians.

Up to 1974, planning in Shell had traditionally focused on the medium and long term, seeking to describe the environment in which today's investment decisions would come to fruition. In this context, the cyclical nature of growth in the short term was taken for granted.

But in the aftermath of the first oil shock, everyone's attention was focused on the short-term economy and its cyclical fluctuations. Such short-term fluctuations would pattern not only economic growth, but oil demand and inflation rates, currency and interest rates, and the sensitive OPEC supply-demand relationship and its politics. Could the scenario approach provide insight?

This second part of my paper describes the development in Shell of our first short-term scenarios, which were presented in May 1975. I include this example not only for what it teaches, but also because the long-term "Rapids" scenarios described in the first part of the paper were somewhat atypical: the major discontinuity was seen to be predetermined; the critical uncertainties were perceived only in the reactions to the discontinuity. The short-term scenarios also represent a different application of the technique.

As I have already indicated, we felt there was no point in doing single-line forecasts in turbulent times. It's perhaps unfair to cite other forecasts gone wrong, since we too have had our share; but here is an OECD forecast of growth for 1975 (made in December 1974) compared with actual growth:

	West Germany	France	Italy	U.K.	U.S.	Japan
Forecast:	+2.5	+3.0	-0.3	+1.8	-2.0	+2.0
Actual:	-3.2	-1.2	-3.7	-1.8	-1.8	+2.1

We would strive instead to apply all we had learned in the previous scenario exercises:

- expand the predeterminеds
- scenarios would then deal with the uncertains
- link to those deepest concerns
- keep the scenario number small
- give them names.

Identify the Predeterminеds

There is, in the minds of most managers, an extraordinary reluctance to entertain the concept of alternative futures; most managers crave certainty. Scenarios of the future will only be accepted when their common elements, the PREDETERMINEDS, have entered the mind of decision makers, unfold in it, and are accepted. We call this process "rocting." It

is like transplanting a tree. "Nemawashi" is the term the Japanese use for the technique of careful preparation of tree roots by grafting them together to give them strength for the transplant ordeal. Similarly, scenarios, if they are to live and develop within a mind-set, have to be "nemawashi'd."

To be successful, this rooting process requires:

- A deep analysis of the predeterminеds. You must go back in time far enough to provide for a common interpretation to events and data.
- Perceptions to be organized in a global framework (as in Chart XIII). This is material directed to the right part of the brain, the one that thinks in terms of pattern and connectedness. Metaphors are frequently helpful to transpose a conceptual framework from the old domain of experience to what will be a new one.

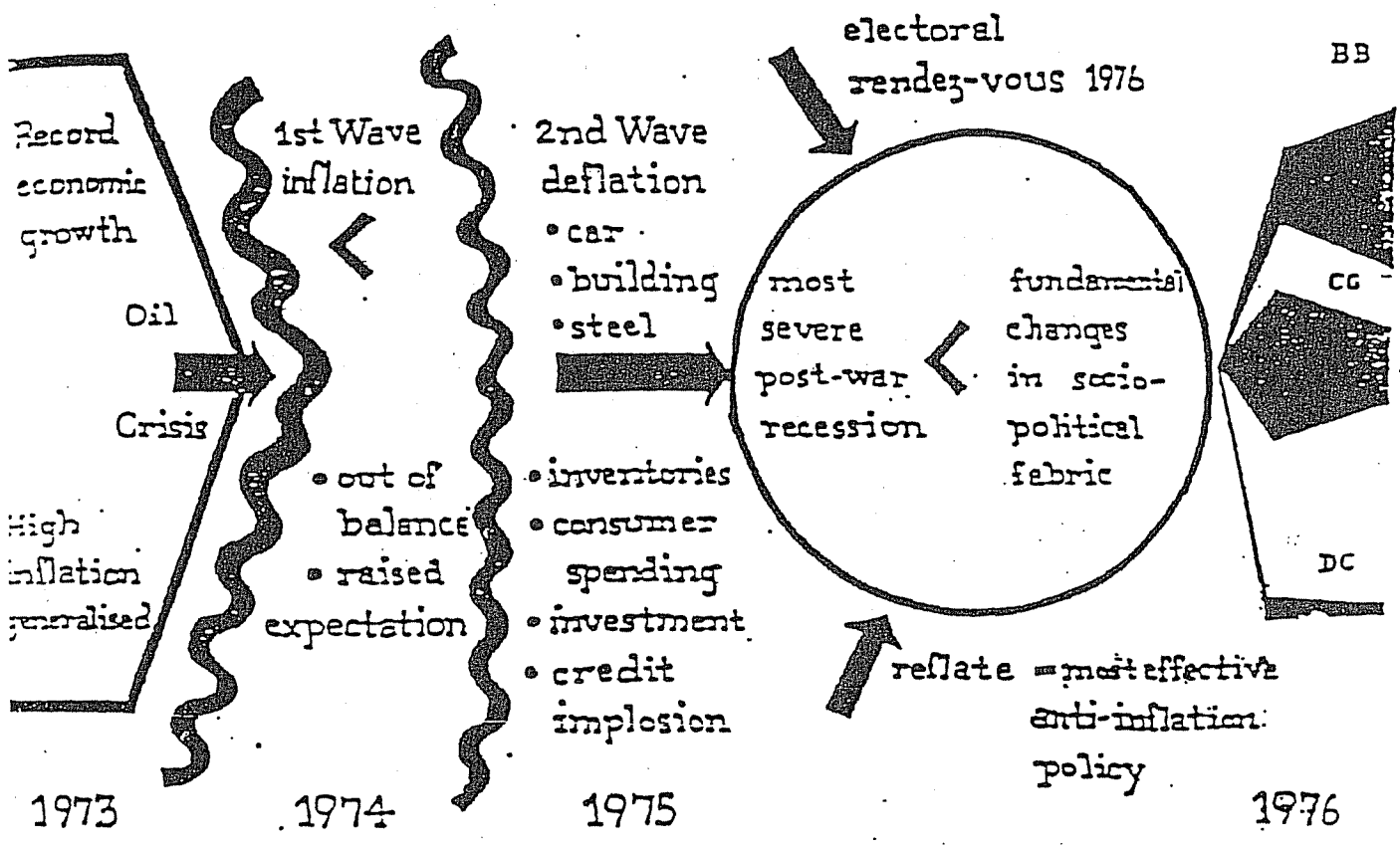
Scenarios on their own,—i.e. the mere description of alternative courses of events—would be effective and alive just as long as a tree without roots. And many of the scenarios I have seen suffer this fate.

The Predeterminеds in the 1975 scenarios are depicted in Chart XIII. It is immediately apparent that a great deal of analysis was given to the "roots" part of the scenarios. We will present these in some detail because in most scenario sets this part is absent or nonexplicit.

1973—The First Wave: Inflation. Like a large rock dropped in a lake, the oil price increase of 1973 generated a series of waves, the first of which was the impact of quadrupled crude oil prices on the general level of inflation. The dynamic effect turned out to be larger than simple cost-through-the-system arithmetic had indicated (on average, 3-4 percent), because world economies in a simultaneous boom were already affected by high inflation prior to the oil shock, and were working close to capacity

Chart XIII

Predetermined Part of the Present Evolution



limitations. Further, the immense publicity given to the oil price increase—coming as it did with production cuts and selective embargoes—created a climate in which major economic actors (trade unions, entrepreneurs, and consumers), overanticipated the actual inflationary impact. This and later overreaction added fuel to the fire and led to a substantial increase in the rate of inflation.

1974—The Second Wave: Deflation. A contraction in demand to well below production capacity was increasingly apparent from mid-1974. The extra cash outflow to OPEC acted like an external excise tax on consumer demand of some $60 billion per annum—or, say, 2.5 percent of OECD

economies. And this was compounded by government anti-inflation policies which pushed demand way below production potential. The economic dominos fell one by one:

- o The automobile industry, always on the margin of discretionary spending and vulnerable to both the real increase in gasoline prices and the "oil link" in the consumer's mind, suffered an immediate decline, with extensive multiplier effects through the balance of the economy.

- o Building and construction, also a major engine of economic activity, went some six months later as government anti-inflation policy caused a credit-crunch.

- o Some nine months after the oil shock, and while most sectors had slipped into recession, the world iron and steel industry was still an island of continuing high activity. Propped up by a backlog of orders (from shipyards, for instance) plus some stock-building, large and welcome orders from the communist world kept it buoyant longer than the oil sector, until eventually the domino effect of automobiles and construction worked its way through.

Two other aspects of behavior deepened the recession: Inventories were run down drastically. Credit controls when demand was already shrinking, and the expectation that prices would fall, guaranteed a drastic drop in inventories. When inventories are reduced by eight days, it's the same as foregoing six months of 5% economic growth; and inventories in many segments of the economy were reduced by more than eight days. Consumer Expenditure, long the stable engine of OECD economies, next took a nosedive. For really the first time since recovery started in the early 1950s, consumers stopped buying and started saving for a number of reasons—e.g., anxiety about high inflation, unemployment growth, world conditions, or future financial security. Basically, they began to worry for the first time in years about what the future might hold.

All this explains why the recession was the most severe since the war:

	Decline in Industrial Production Measured from the Previous Cyclical Peak		
	USA	Europe	Japan
This recession (at 1st quarter 1975)	14%	9%	19%
Previous post-war recessions	7%	2%	2%

Electoral Rendezvous: Another Predetermined. The governments of the three major OECD economies would face the electorate in 1976: Japan, Germany, and the U.S. It's an old truism that people vote their pocketbook, and presiding over a recession is an invitation to defeat at the polls. The incentives for these incumbent governments to go for growth would therefore be overwhelming.

Reflation in the Pipeline--A Predetermined Too. Not only were politicians' eyes on the 1976 elections, but there was also a keen awareness that much of the 1975 hardship was unnecessary and self-inflicted—the deflation was too harsh. With excess capacity now so widespread, reflation could be undertaken safely and expanding output could reduce unit prices and further curb inflation. Moreover, such reflation would be largely self-financing through taxation on increasing income, sales, profits and lowered costs for unemployment benefits.

Long-term unemployment was becoming evident as a social problem. Unemployment falls most heavily on the young, and few governments could afford to do nothing at the prospect of a third graduating class moving from the classroom to the welfare rolls.

All of these predetermined factors combined to make reflation attempts a virtual certainty.

1975 Scenarios for the Rapids--The Uncertain Part

We had spent a lot of time developing the PREDETERMINEDS. The bridge we had built was now firmly anchored in our decision-maker's experience, since we had gone back far enough to include those events which had already unfolded and of which they were painfully aware. We also took care in this rooting process to develop those matters which, while not yet evident, would almost certainly occur. Reflation of economies would be the expression of the "Predeterminеds." What was unknown was the timing of the recovery and the nature of it.

We designed two recovery scenarios:

Boom and Bust--a vigorous recovery which had within it the seeds of its later destruction.

Constrained Growth--a kind of muddling-through recovery but fundamentally different than earlier business cycle recoveries.

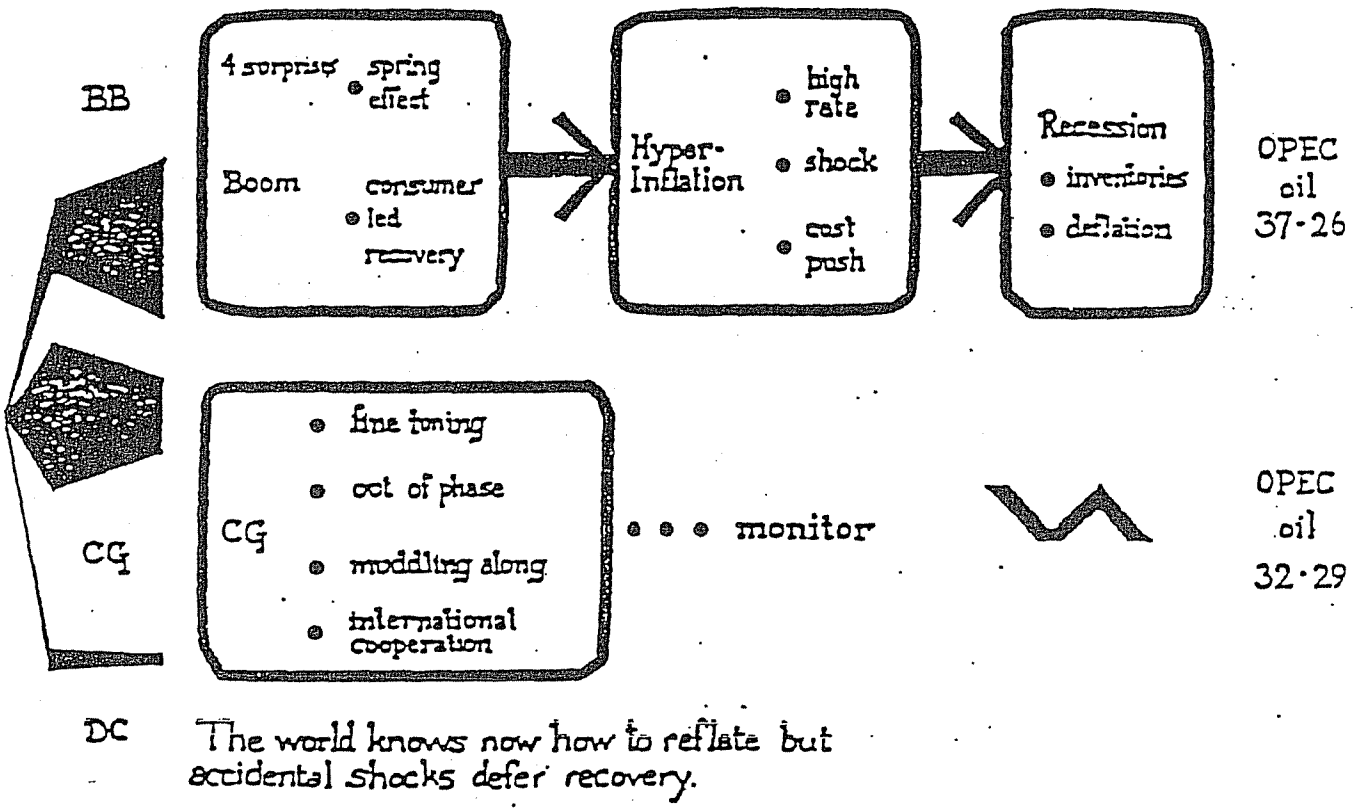
The two scenarios are depicted in Chart XIV. We allowed, too, for the possibility that reflations might not happen (for whatever reason), by including a Depression Contingency; it seemed so improbable, however, that it was not considered relevant for Planning.

A. Boom and Bust described a world which develops in cycles of greater amplitude and shorter duration than those of the 1960s, more characteristic in fact of the 1950s. It was clear that the longer the recovery was deferred, the more likely this scenario would become as governments turned to panic measures to reflate their economies.

Boom and Bust was founded on apparent surprises.

Chart XIV

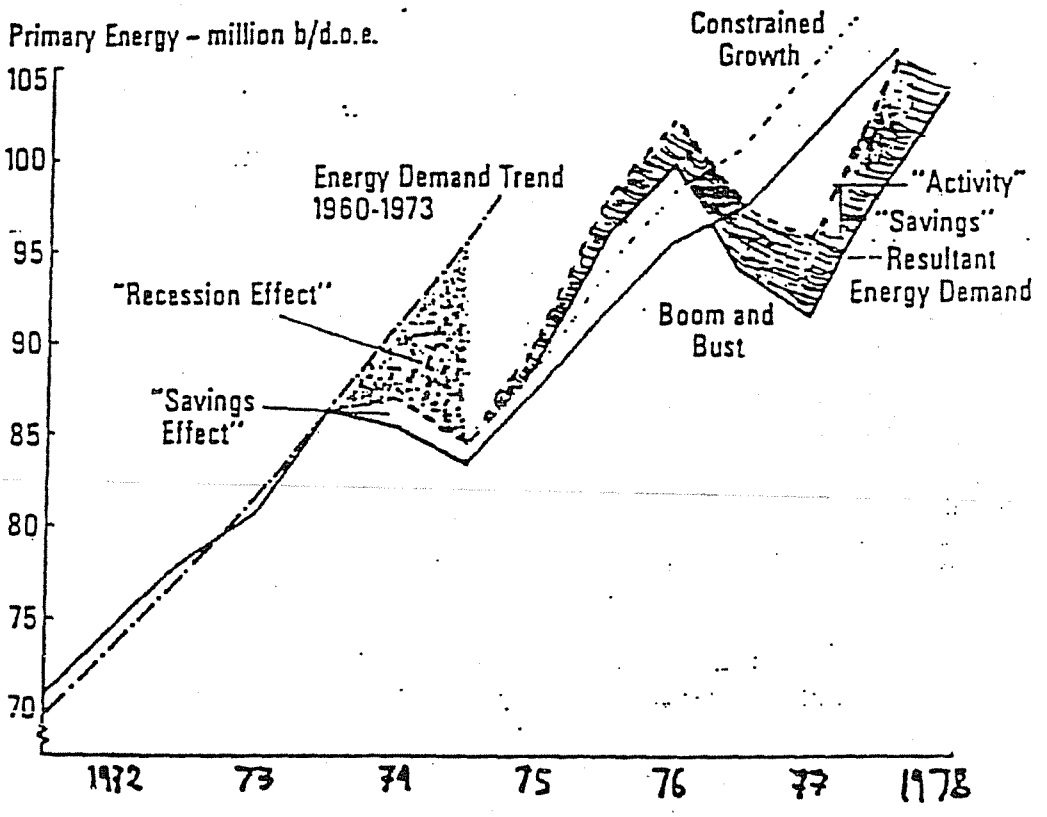
The Uncertain Part: Two Scenarios for the Rapids



First Surprise—Recovery Could be Very Rapid. The first surprise would be the rapidity, strength, and forcefulness of economic recovery. It would not be abnormal, for instance, to see the U.S. economy grow by 11 to 12 percent in eighteen months. (See Chart XV.) In GNP terms, this would be equivalent to the appearance on the world map of an economy the size of the U.K. in this short time span. The potential for this lay in the depth of the then current recession and the amount of U.S. production potential underemployed, which—like a coiled spring—would rebound and sustain very rapid growth for a short period. An annual growth rate of 8%, typical of past booms, would certainly not imply spectacular achievements but only reflect the depth of the 1973-75 dent in the economy.

Chart XV

WOCA Energy Demand—Recession and Savings



Second Surprise—The Recovery Could be Oil-Intensive. The energy intensity of the coming boom would constitute the second surprise. Newspaper reports of energy savings would persuade the intelligent layman that "Western" responsiveness would largely negate OPEC's initial negotiating strength. This, however, could not stand up to analysis. The largest single factor reducing oil consumption had not been any fundamental change in behavior, but rather the extent of the recession, which had cut both industrial and consumer demand. A boom in 1976 or 1977 would therefore find the majority of consumers reverting to their previous

patterns of behavior and consumption. Energy savings could be very important in the 1980s, when it might be surprising how much GNP could rise without increasing energy use. Not, however, in 1976-77, when economic growth would be fueled by a major increase in demand for energy (Chart XV) and particularly for oil.

Third Surprise--U.S. Oil Imports Could Boom. The third surprise would be the rapidity and the magnitude of the increase in U.S. oil imports. One could forget all about "Project Independence," President Ford's import reduction targets, and alternative energy projects. Our estimates indicated that in the first year of recovery, U.S. imports would rise by 2.5MM B/D (i.e., more than Britain's total imports or Kuwait's current exports). In the second year, there could be a further increase of 2MM B/D, (in aggregate, more than Britain's total energy consumption). We had seen that normal recovery in the U.S.A. would be equivalent to the sudden creation of a new economic nation, somewhat larger than the U.K. We could now add that this new nation, like Japan, would be almost totally dependent on oil from the Middle East. Consumer countries would once again realize they were in a trap, and that their recovery was entirely in the hands of a few Middle East governments.

Fourth Surprise--Alternative Energies Would be Stagnant. The fourth surprise would be the discovery that alternative energy programs consisted largely of empty words and paper tigers. Most nuclear plants were operating well below design capacity and many had been deferred or cancelled. In the coal sector, little had been done, and the OECD nations were slipping progressively further behind their target forecasts. The world was far removed from the "crash programs" of which one had heard so much in the dark days of the oil embargo, and alternative energies would

provide little relief to consumer countries' growing dependence on Middle East oil.

The Bust, or Second Recession. The next threat in the Boom and Bust scenario was high levels of inflation--approaching hyperinflation in many of the weaker OECD nations. In broad terms, the inflation rate would exceed the highest levels of 1973-75 plus, a further 5 percent. These levels would become intolerable in sociopolitical terms, and would be the signal to governments in the industrialized world that the boom was getting out of control. They would then have little choice but to reapply the deflationary measures so recently removed. Credit restrictions would be imposed and interest rates would climb; import controls might appear here and there and measures to reduce the consumption of oil imposed. Just as reinflation was likely to have been surprisingly rapid, so the downturn could be very sharp. Inventories would play an important role: stockbuilding, starting from depths of the current recession, would contribute to the growth of production during the upswing. But as liquidity disappeared in the face of strong deflationary measures, stocks would be run down rapidly, making the downturn that much sharper.

Probability Assessment for Boom and Bust. We felt that this scenario's dramatic implications for all sectors of the world economy made it difficult to be objective and give equal attention to the other scenarios. Nevertheless, we considered it to be less probable than the alternative scenario, Constrained Growth. We would make no forecasts about when a boom could start, although we believed it could take off any time from third quarter 1975 onwards. But the longer recovery took to get underway, the more likely that it would be of the "Boom and Bust" variety (see following table).

Probability of Scenarios Starting:

	Mid-1975	Mid-1976
Constrained Growth	.60	.30
Boom and Bust	.30	.65
Depression Contingency	.10	.05

B. Constrained Growth. Everything in Boom and Bust was normal; the "surprises" were typical of business cycles that had happened previously. Constrained Growth on the contrary had a genuine surprise: recovery would be different, slower and more halting, than that experienced in post-World War II cycles.

The central idea was that the underlying high-growth trend of the past twenty-five years had come to an end. This would not result simply from the oil shock or the eclipse of the Bretton Woods monetary order. It would be because the very success of the post-war economies induced certain limits to continued vigorous growth. Along with unprecedented economic growth had come unprecedented expectations in standards of living and social welfare programs. These, in turn, led to a new kind of rigidity as governments became locked in to ever-increasing taxes needed to pay for these social programs. Industrialized countries were now slower to change and adjust to new factors—whether it be a response to an oil crisis or to new competitors like Japan and the newly-industrializing countries of Southeast Asia.

Constrained Growth would characterize the first years of this new economic world (which, in a long-term scenario introduced in the previous year, we called the "World of Internal Contradictions"). We concluded that all the motors of economic growth—consumption, international trade, government expenditure and investment—would work with less power in the next fifteen years due in particular to the trend for governments to become top-heavy with the impact of growing social welfare commitments.

Investment was especially emphasized as a change which we called the "technological recession," and would be dramatic and quickly felt. From the end of World War II until the early 1970s, the best new technology in basic industries could replace existing technology on its own merit. A new steel plant, for example, was more economic than an existing one, per ton of capacity; so too were new cement and paper plants, new refineries, tankers, or new power generation plants per kilowat of capacity. But from the late 1960s or early 1970s, technological progress became incapable of beating inflation. The cheapest method now to get new capacity was not to buy new plants, but to acquire existing capacity. Thus, there was both a slowdown in technical progress and an increase in inflation.

We felt that a situation had been reached--at least temporarily, for perhaps ten to fifteen years—wherein both the unit capital and operating costs of almost all new plant in basic industries would exceed those of existing equipment. This was a major discouragement to new investment in most industries that had been the engine of economic growth since the war, and would result in a structural change in the global economy. It could further accentuate inflation in any future upturns. Similar analyses were done for the other motors of growth: government spending (budget deficits and more rigidity); consumer spending (increased maturing in the life cycle of a large range of consumer durables), and international trade (accumulating imbalances and frictions).

The overall conclusion that economic growth prospects were perceived to be well below past achievements and the trends of the sixties and early seventies. We could enter--by means of the Constrained Growth period—this completely new "World of Internal Contradictions": a world of lower economic growth in stark contrast to the booming economies of the previous twenty-five years.

Focused Scenarios

Let me give one final example of how global scenarios were then used to focus on specific issues or projects. From one viewpoint, scenarios are like cherry trees: cherries grow neither on the trunk nor on the large boughs; they grow on the small branches of the tree. Nonetheless, a tree needs a trunk and main branches in order to grow small branches.

The global, macro-scenarios just described are the trunk; the large branches are country scenarios developed by Shell operating companies, in which factors individual to their own countries--predetermined and uncertain--are taken into account and added. But the real fruits of the scenarios are picked at the small branches, the focused scenarios which are custom tailored around a strategic issue or a specific market or investment project. One example of focused scenarios follows.

As OPEC oil is the balancing factor in the world energy system, its fluctuations reflect cyclical economic fluctuations but several times amplified. A given percentage decline in economic activity translates into a larger decline in world oil consumption, and into a much larger decline in OPEC oil demand, because: energy-intensive industries (like cement and steel) are more than proportionally affected in a recession; non-oil energies are usually cheaper than oil; and finally because OPEC oil has to be paid in foreign exchange as opposed to domestic oil. Conversely, in a recovery, a small increase in world energy demand would be translated into a larger increase in oil demand and a much larger increase in OPEC oil demand. In the Boom and Bust scenario, a 13 percent increase in world energy demand in the first two years of a recovery would be translated into

a 23 percent increase in world oil demand and into a 34 percent increase in OPEC oil demand. How would this demand match available supply?

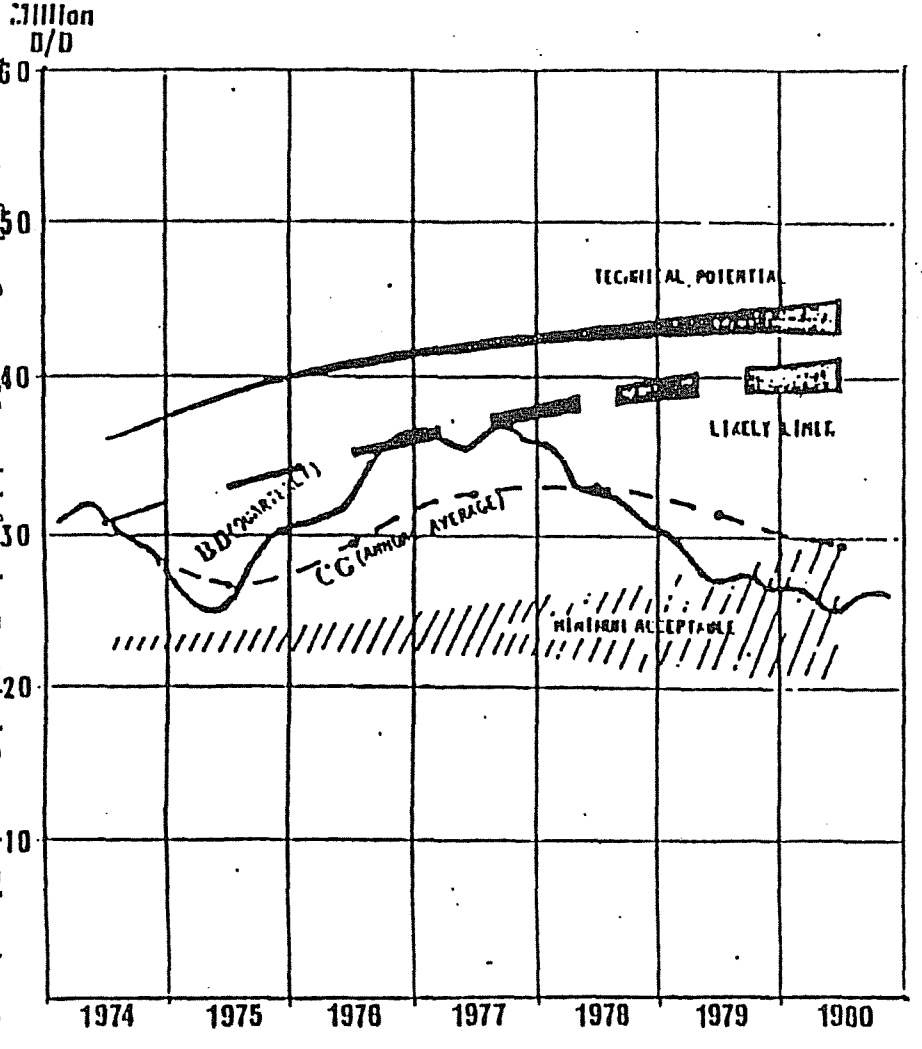
The fluctuations of OPEC oil production develop in a narrow band between two danger zones (see Chart XVI): the upper one, dangerous for oil-consuming countries, is set by technical production capabilities and is called "OPEC willingness to produce"; the lower one, dangerous for oil-producing countries, is the threshold of "OPEC dissatisfaction" where the solidarity and discipline of OPEC comes under severe stress and when prices might erode.

We made two simulations (Charts XVI and XVII). The demand changes implicit in a normal boom starting in late 1975 would become clear in winter 1976-77, when supply would be dangerously tight and prices under severe pressure. A boom starting only in late 1976 would be less dangerous.

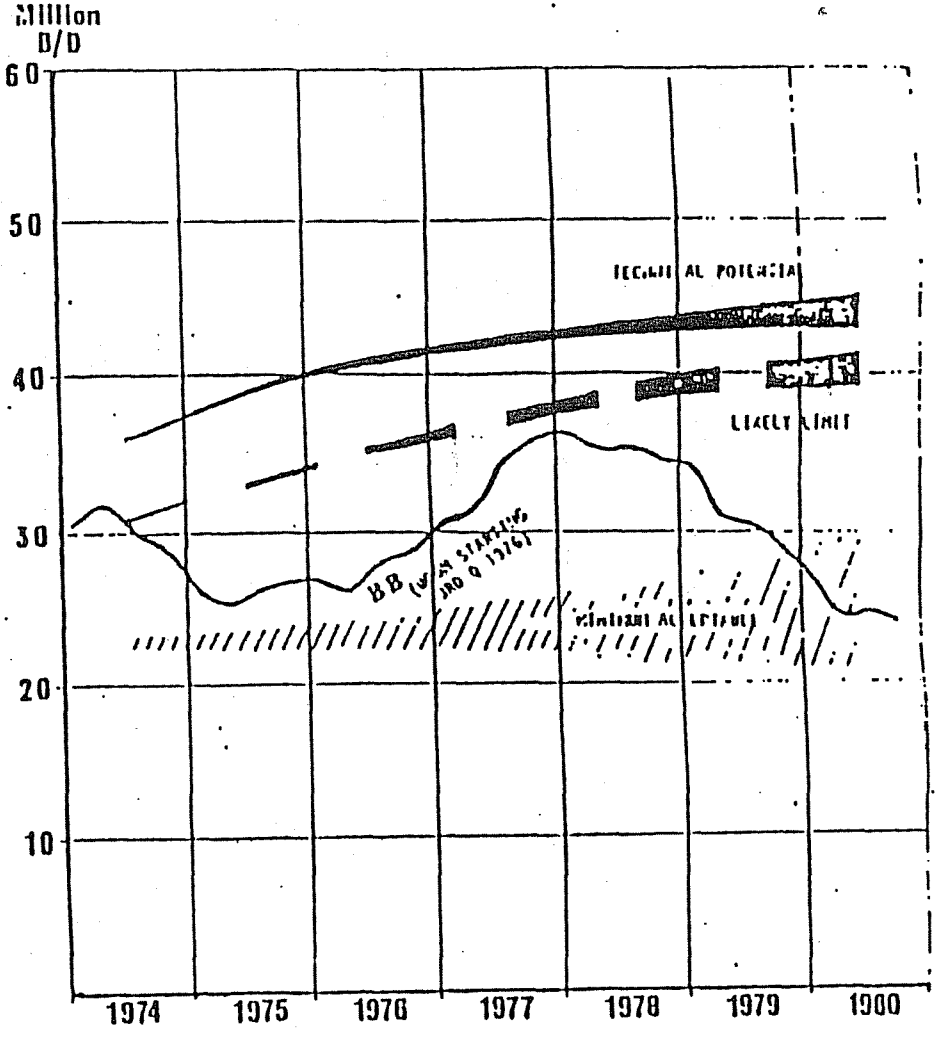
The 1975 Scenarios in Hindsight

As events turned out, economics developed mainly along the lines of Constrained Growth in the recovery of 1976, 1977 and 1978, and we were introduced to the World of Internal Contradictions. What had been the floor for long-term economic growth expectations before 1973 now became the ceiling. What turned out to be particularly fortuitous for Shell was that many managers took full cognizance of this new slower growth era they were now entering and hedged their business plans accordingly. The leanness and restructurings that the 1980s would demand were thus helped by beginning the diet regimen early. That Shell saw this new world earlier than most could be seen by comparing the various energy forecasts made at

OPEC : Production Boundaries and Seasonal Requirements



OPEC : Production Boundaries and Seasonal Requirements



the time. Shell consistently projected one of the lowest energy growth paths for the 1980s.

There are two main purposes of scenarios: one is to avoid regret; the other is positive and creative—to see new strategic options that you were not previously aware of. This positive aspect is in the long run the more important, and will be developed more fully in the conclusion to this paper. But let me add here that, despite the fact that the "Boom and Bust"--the most dramatic and (for Shell companies) dangerous of the two scenarios—did not occur, the exercise proved useful enough for our managers that short-term scenarios were prepared every year thereafter. As K. MacMahon of the Bank of England has so succinctly observed:

> "No time is as usefully wasted as that spent guarding against disasters that do not in the event occur."

CONCLUSION

Scenarios are clearly much more popular in the world of "futurists" and commentators than in the world of decision makers. Futurists have learned to create "interesting" scenarios, but rarely ones which attract more than passing interest from decision makers. There are important differences between scenarios which "tell a story" and scenarios which are of real help for decision makers, "decision-scenarios."

Scenarios that merely quantify alternative outcomes of obvious uncertainties—first generation scenarios—never raise a management team to enthusiasm. Most managers do not like to face such alternatives. They yearn for definiteness when dealing with the business environment, even after they have had their fingers burned for relying on past forecasts. The same managers who are superb at deciding on alternative courses of action where they are in control often come unstuck when confronted with alternative futures they don't control and don't really understand. This is partly cultural. Many such managers developed their reflexes and skills in the 1950s and '60s, a management era shaped by unusually high predictability. To be competent then was to know the right answer; it was incompetent, unprofessional, to say, "Things could go this way, or they could go that way."

There is a still deeper reason that causes many decision makers to reject scenarios. The quality that most lifts managers to the top of large organizations is their good judgment. They identify with it and trust it, their faith in it is a key motivation. Most scenarios confront them with uncertainty where they cannot easily use that good judgment. The use of this best quality is denied them, and the tendency then is to say, "Why bother with all that scenario stuff? We'll go on as before." The

desire for a framework, within which they can exercise their judgment, is so strong that many managers continue to rely on forecasts, even though they know that forecasts often miss major turning points in their environments.

What distinguishes "decision-scenarios" from their sterile namesakes is subtle. All too often this critical factor falls outside the field of vision of scenario designers: they don't even realize that it has been missed!

Almost by definition, scanning the business environment and crystalizing the findings in a set of scenarios deals with the world outside the corporation, e.g., evolution of demand, supply, prices, technology, competition, business cycle changes, etc. This is only a half-truth, and is dangerous because there is another half. Because the raw materials of scenarios are made from this stuff of "outer-space," it's not realized that something more is needed: scenarios have to be made alive for "inner-space," the microcosm of the decision maker—this stage of the mind where alternatives are played out and where judgment is exercised. Scenarios deal with two worlds: the world of facts and the world of perceptions.

Decision-scenarios explore for facts out there, but they aim at perceptions inside the head of critical decision makers. Their purpose is to gather and transform information of potential strategic significance into fresh perceptions which then lead to strategic insights that were previously beyond the mind's reach—those that would not even have been considered. This transformation process is not trivial; it is genuinely creative. It is an "aha!" experience. Scenario planning is a discipline for rediscovering the original entrepreneurial power of creative foresight

in contexts of accelerated change, greater complexity and genuine uncertainty.

In this concluding section of the paper, we look first at some "do's" and "don'ts" of the discipline: they all derive from facilitating the transformation process, in particular when they appear at variance with common practice. Then we examine a key aspect which makes the discipline creative.

A Discipline

Decision-scenarios are not a mere range of possibilities... or a sensitivity analysis around one critical variable... or an optimistic case and a pessimistic case... or a different mix of premises... or interesting stories of what could happen in the future.

Scenario analysis is a disciplined way to think about the future. It demands above all an understanding of the forces that drive the system, rather than reliance on forecasts (that is someone else's understanding and judgment crystallized in a figure, which then becomes a substitute for thinking for the person who uses it). It is as different from relying on forecasts as judo is from boxing: you want to use outside forces to your competitive advantage and make them work for you, in order that 2 + 2 = 5 or much more. There is little or no power in merely accepting information about an outcome (such as the future price of oil, or the future level of demand); the power lies in understanding the forces behind the outcome. For this it is fundamental that decision makers develop their own feeling for the nature of the system, the forces at work within it, the uncertainties that underlie the alternative scenarios, and the concepts used to interpret key data.

Scenarios structure the future context into predetermined elements and genuinely uncertain elements. The foundation of decision scenarios is exploring and expanding the predetermined: (1) events "already in the pipeline," but whose consequences have yet to unfold; (2) interdependencies within the system (surprise outcomes often arise from interconnectedness), (3) trend breaks, i.e., unfoldings that cannot continue, and (4) the "impossible." One of the most useful structurings of decision scenarios is to focus on and rule out the impossible events; decision-scenarios usually deny much more than they affirm.

Contrast the 1971 scenarios (p. 11) with the 1973 scenarios (p. 37): a major difference is the work done on the predetermined. The first set covered the range of possibilities and included everything believed plausible. The second set ruled out ever-increasing demand and low-priced oil; it said that muddling through was not on, that alternative fuels could not come to the rescue; and so forth. The difference in these two scenario sets was primarily the amount of work done on exploring and expanding the predetermineds. A set of scenarios which stresses uncertainty only, that is alternative developments, is like a tree without roots; a vital part is that which is common to all of the scenarios, the predetermined.

Scenarios acknowledge uncertainty and aim at structuring and understanding it, not merely by criss-crossing variables and producing dozens or hundreds of outcomes, but by creating a few alternative and internally consistent pathways into the future. Neither are decision scenarios a group of quasi-forecasts, one of which is likely to be the right one. Instead, decision scenarios describe different "worlds", not just a different outcome of the same world. Never more than four (or it becomes unmanageable for most decision makers); the ideal number is

"1 + 2"--i.e., the surprise free implicit view (showing explicitly why and where it is fragile), and then two other "worlds" or different ways of seeing the world, whose "logic" or main theme focuses on the critical uncertainties.

The point, to repeat, is not so much to have one scenario which "gets it right" as to have a set of scenarios which illuminate the major forces driving the system, their interrelationships and the critical uncertainties. The purpose, in short, is to help decision makers sharpen their focus on key questions about the environment, and to aid them via additional concepts and a richer language system through which to exchange ideas and new data.

The most dangerous scenario design is three scenarios that describe alternative outcomes along one dimension only, because many managers cannot resist the temptation to identify with the middle one as a "base line" and treat it essentially as a forecast. A scheme based on two scenarios raises a similar risk if the two are easily seen as "optimistic" and "pessimistic." Reality must be somewhere between, and could easily be seen as "splitting the difference"—an outcome not very different from starting with a single line forecast.

What is characteristic of decision scenarios is that they focus at the end on critical uncertainties possibly very different from those which seemed "obvious" at the beginning. It is characteristic also that, despite this focus on uncertainty, they do not paralyze decision makers. Rather, the deeper understanding of the risks that is gained often makes the decision maker capable of confronting apparently greater risk.

Scenarios are also an effective device for organizing a variety of much seemingly unrelated information, economic, technological,

competitive, political, societal--some quantitative, some qualitative, and translating it into a framework for judgment (in a way that no model, for instance, could do).

Important:

A planner who tries to develop a set of decision scenarios without knowledge of his decision-maker's microcosm and deepest concerns is attempting an impossible job. When the scenarios described in this paper were done, we did not fully appreciate this. We were lucky, however; our managers' concerns turned out to be precisely those we were dealing with because of their magnitude and obviousness when they were developed. Later, we learned techniques of interview to find out the deep concerns of managers, and to illuminate the existing decision-framework. Now, the interview discipline is one of the first steps taken when starting a scenario exercise.

The decision-scenarios described in this paper were global or macro-scenarios. To do specific analyses of parts of the business, one develops "focused scenarios" custom-tailored around a strategic issue, or a specific market or investment project. But you cannot start with such focused scenarios because you will almost certainly miss key things, or cast the focused scenarios in the wrong way. You must wide-angle first t get the big picture, and then zoom in on your business specifics.

Finally, scenarios are most effective when used with two other tools.

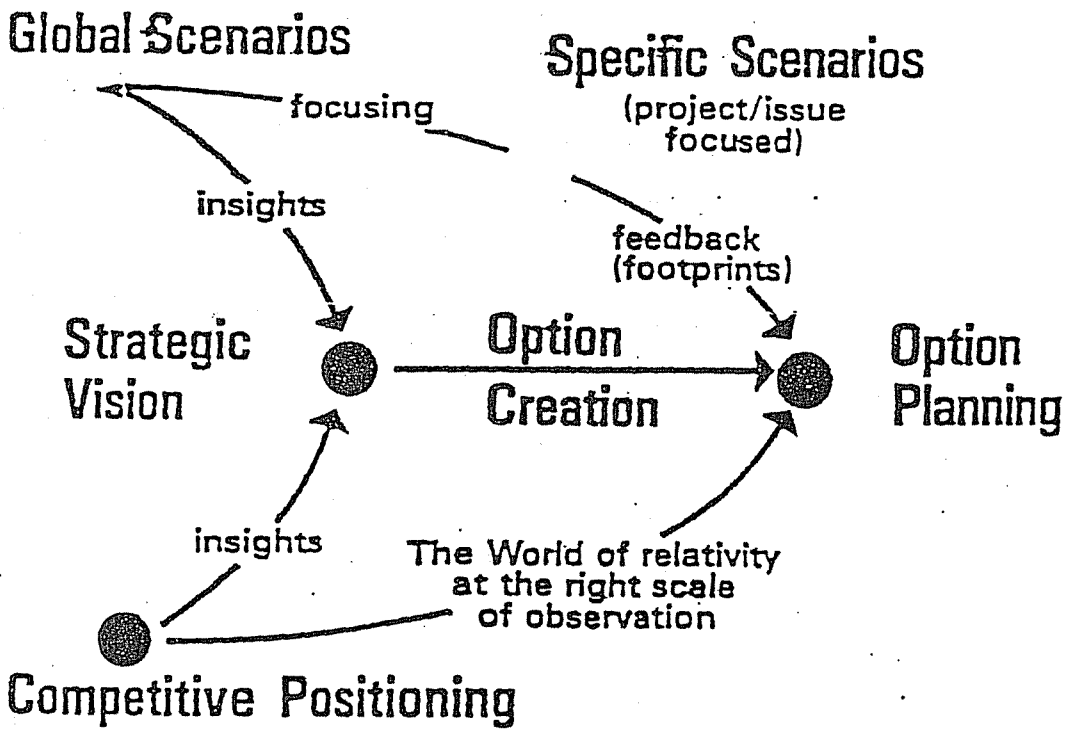
Strategic Vision. A clear, structured view of what kind of company you want to be, which precedes what you want to do (investing, divesting, penetrating a new market, etc.).

Option Planning. In most planning approaches, strategies are forward on a single line (which is more dangerous even than single line forecasting), and options--if there are any--are merely straw men, not r

options. Option planning is a discipline to be practiced both at the level of business units and at corporate level, in which all options are put forward on a neutral, nonadvocative mode.

The purpose of this combined approach is "option generation." If the scenario process does not bring about the emergence of strategic options which were previously not even considered, the process has been sterile.

Chart XVIII



Scenarios and the Gentle Art of Re-perceiving

> "Genius, in truth, means little more than the faculty of perceiving in a nonhabitual way" (William James).

It is well known that companies differ greatly in the effectiveness and speed with which they can transform the potentialities of

scientific progress into innovation (that is, new products or new processes). Similarly, in times of rapid change, the effectiveness and speed with which companies identify and transform information of strategic significance into strategic initiatives can differ just as much. Today, this capacity is obviously critical.

Unless particular care is taken over this process, really "new" (novel) information that is outside the span of expectations may not penetrate the core of the mind of a decision maker--that intimate stage of the mind where possible futures are rehearsed and where judgment is exercised.

There are many well-documented historic examples: Stalin, after concluding the non-aggression pact with Hitler in 1939, was so persuaded that the Germans would not attack as early as 1941, and certainly not without a prior ultimatum, that he ignored 84 warnings that "Operation Barbarossa" was about to be launched. According to Barton Whaley in Codeword Barbarossa (M.I.T. Press, 1973), these included warnings such as personal communications from Churchill, from Soviet spy Richard Sorge in the German embassy in Tokyo, withdrawal of German merchant shipping from Soviet ports, and evacuation of German dependents from Moscow. Pearl Harbor, as documented by R. Wohlstetter, is another such case. The fundamental problem throughout this intelligence failure was "noise," the massive volume of signals. "To discriminate significant sounds against this background of noise, one has to be listening for something or for one of several things... one needs not only an ear, but a variety of hypotheses that guide observation." (R. Wohlstetter: Pearl Harbor Warning and Decision, (Stanford University Press, 1962), emphasis added). It is revealing that the Japanese commander of the Pearl Harbor attack, Mitsuo

Fuchida, in his different microcosm was surprised at achieving surprise and asked, "Had these Americans never heard of Port Arthur?" (an episode famous in Japan where the Japanese navy destroyed in a surprise attack the whole Russian Pacific fleet at anchor in Port Arthur).

Cases in the business world are, for obvious reasons, less well documented. The author could personally observe the French steel industry with the "FOS project," the tanker market before and after the first oil shock, petrochemical investments in Europe in the seventies and a large American car manufacturer's misinterpretation and dismissal of Japanese competition during a good part of the 'seventies.

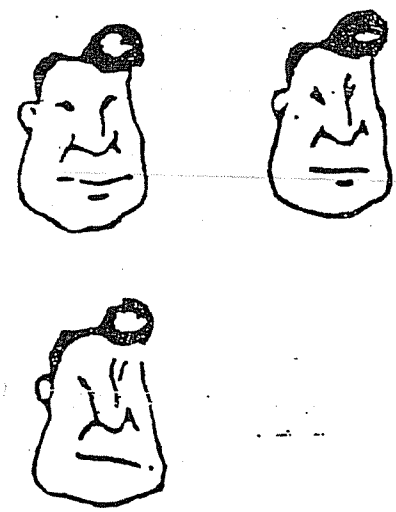
In all of these cases, a number of managers were involved (not just one individual), the inappropriate behavior extended over several months or even years (not just a one-time error), and the stakes were very high. They were all crises of perception—inability to see—and not cases of wrong strategic reasoning. Within the context of the view of the world these decision makers persisted in, their strategy made sense; sometimes it was brilliant.

In our times of rapid change and discontinuity, these crises of perception—the inability to see a novel reality emerging by being locked inside obsolete assumptions—have become the main cause of strategic failures, particularly for large and internally well-managed companies.

While failures are clearly visible, opportunities missed by not seeing them in time are probably more important. "The greatest danger in times of turbulence is not the turbulence; it is to act with yesterday's logic" (Peter Drucker).

The following graphic example illustrates, at the most elementary level, the process of persisting in seeing only what we are prepared to

see. If one sees a face, to start with (below), one can go a long way and still see a face. The important point is: it is almost impossible to break out of an inappropriate mental frame while perceiving and experiencing within it. As the Chinese proverb says, "The fish is the last to know it swims in water."



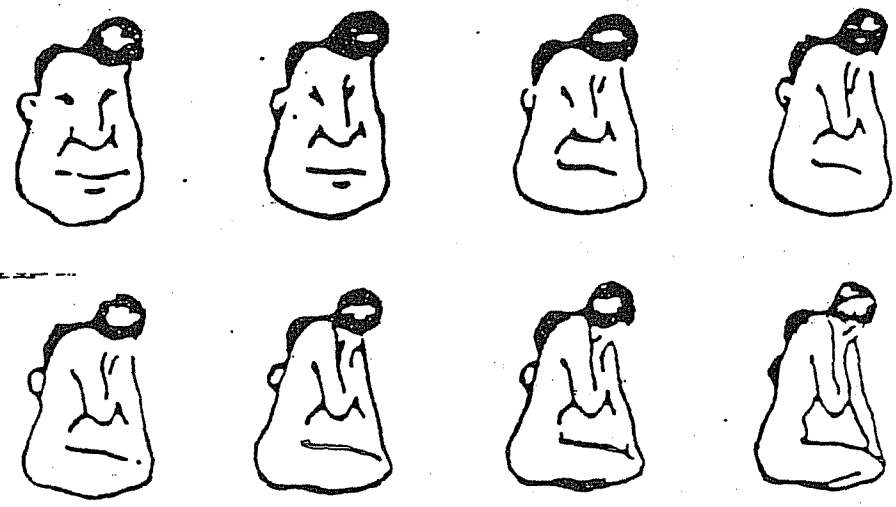
Central to decision-scenarios, where they succeed or fail, is the microcosm of the decision maker: his inner model of reality, his organized set of assumptions which structure his understanding of how and why his business environment is going to unfold, and what are the critical factors which make and will make for success. This inner model never mirrors reality: it is always a construct: microcosms are basically superior "simplifications"; they deal with complexity by focussing on what really matters.

In stable times (business-as-usual, more-of-the-same), there will be a reasonably good match between the mental model of a successful decision maker and unfolding reality. A little adjustment and fine tuning will do. Decision-scenarios would have little or no leverage here.

But in times of rapid change and increased complexity the mental model becomes a dangerously mixed bag: enormously rich detail and deep understanding can coexist with dubious assumptions, selective inattention to alternative ways of interpreting evidence, and projections that are a mere pretense—blind spots and dead angles. It is here that the scenario approach has leverage and can make the difference.

In such circumstances, a microcosm based on past experience and prolonged by the usual type of forecasts is inherently suspect and most likely inadequate; yet it is almost impossible to break out of one's world view while operating within it. When one is committed to a certain way of framing an issue, it is extremely difficult to see solutions which lie outside this framework.

Decision-scenarios, by being alternative "ways of seeing the world," are a systematic method for breaking out of this one-eyed view. In a proper sense, such scenarios confer a gift of second sight and can achieve something very precious: the ability to re-perceive reality. In times of change there is definitely more to see than we normally perceive—more information potentially relevant to us lying around unnoticed because, being locked into our way of looking, we fail to see its significance.



It has been my repeated experience that the perceptions which emerge when the disciplined approach of scenario analysis is practiced are not only richer and substantially different in critical aspect from the previous implicit view. They are also qualitatively different. The process of converting information into fresh perceptions has something of a "breeder effect": it clearly generates energy, much more energy than has been consumed during the process of scenario analysis in terms of time and effort.

A mere "high" and "low" around a base-line would never achieve this conceptual reframing. The re-perception and discovery of strategic openings which follows this breaking out of one's own assumptions--many of which are so taken for granted that one is no longer aware of them--is, after all, the essence of entrepreneurship. Scenario planning, to repeat, is a discipline aimed at rediscovering the original entrepreneurial power of foresight in contexts of accelerated change, greater complexity and genuine uncertainty.

It is precisely in these contexts--not in stable times--that the real opportunities lie to gain competitive advantage through strategy.

"Uncertainty, my friend. . .
. . .discontinuity, mon amour!

Acknowledgement

The charts in this paper are reproduced with the kind permission of Shell International Petroleum Company. The author would like to acknowledge the many original contributions to the development of scenarios by his former Shell colleagues--both managers and planners, and by members of that unusual unit called Group Planning. The conceptualization of scenario analysis has benefited greatly from discussion with Harvard Business School colleagues, in particular Bruce Scott and David Bell. This paper would never have been written had it not been for the encouragement and editing help of Norman Duncan and Peggy Evans. This paper expresses what the author has learned in the process; it should not be inferred that this represents Shell's current planning views or practices.