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Benefits of Scenario Planning Applied to Energy Development

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Abstract

Scenario planning was first used effectively by Royal Dutch Shell approximately 40 years ago. The company recognized that efforts to predict exactly the future are unlikely to be very successful. The premise of scenario planning is that organizations look at possible future trends and project several possible futures (or scenarios). The intent is to project enough such scenarios, even unlikely ones, that they “bracket” possible futures. This enables one to assess the ability of their policy, process, or design to perform positively within any of the scenarios and thus represent a truly robust choice. This paper briefly describes some examples of use of scenario planning within the energy sector, as well as some unusual factors that may influence the outcomes.

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Keywords: planning; scenarios; energy; uncertainty

1. Introduction

Scenario planning arose from a recognition that one could not predict the future with any accuracy at all. Its first use was by Royal Dutch Shell [1] over forty years ago, and it has been widely and effectively employed in many arenas to look at a possible range of actions and the resultant impact on policies, designs, and the like. The intention is to anticipate future possibilities in such a way as to develop the most robust plans, designs, and policies leading to sustainable solutions [2] [3]. The purpose of this paper is to broaden exposure of the use of scenario planning to additional audiences. While this powerful tool is being used by growing numbers of corporations, it has been used very little in policy formulation and monitoring. Given the inability to predict the future with any certainty, it is

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critical to consider various plausible futures against which to measure one's programs. While research leading to this paper has not developed new techniques, it did identify the lack of use of existing techniques by policy-making bodies.

2. Rationale for use of scenario planning

There are many historical examples of the failure of traditional predictions. Of more current interest is the severe drop of oil prices. Venezuela, which holds the world's largest petroleum reserves is noteworthy because of their excessive reliance on income from oil exports. Numerous predictions of oil prices to 2050 ranged from \$95 to almost \$150. If Venezuela had engaged in scenario planning, perhaps they would have taken some steps in other strategic directions. For example, low oil prices could encourage development of a broader industrial base.

In the field of sustainable development, including energy, there are numerous areas of uncertainty to be considered. These can include, as a minimum, the following: changing environmental regulation; technology improvements; variation in energy prices; impacts of climate change; and political changes. Among social issues, one could list such items as increasing population, with a shift to an older population, increasing income equality, disparities in health care, and increasing migration. Technological changes include improving and pervasive internet and social media access, falling costs for renewable energy sources, increased uses of nanotechnology, and improvements in health care, although access to such is not uniform. Economic impacts can be seen through shifting job markets and relocations, outsourcing, the European Union, and displacement of workers and movement toward service and knowledge sectors. Environmental issues take many forms, as seen in many cities suffering from air pollution and trying to decrease urban automobile travel, availability of clean water not uniform, and energy access spotty in some regions. Of course, the problems due to climate change exacerbate many of these issues. Politics and political change create some uncertainty, and growing stresses due to terrorism and migration are of increasing concern as global alliances shift. Scenario planning uses an outside-in approach, from external (little if any influence) to internal (more control). The process is intended to break down barriers and change the dialogue in strategic discussions. It further enhances organizational learning, in which the organizations continuously learns about itself.

3. Scenario planning process

The focus of the scenarios depends upon the organization developing them. For example, Shell is looking for its future. The World Energy Council is looking at the entire world, with results also for regional differentiation.

In each case, as scenarios evolve, there are several types of futures [4], including the following:

Probable: This is largely a projection using current trends; Plausible: This includes scenarios to be developed by processes to be indicated and significantly increases the range of outcomes; Possible: These include events that outside ordinary expectations. These include events such as disruptions (including disruptive technologies), black swans, wild cards or surprises like the Fukushima incident; Preferable: This what the organization would prefer. For the scenarios, those doing the planning are trying to answer the question "What might we need to do?" The same is true for those asked to add their experiences and thoughts. Fig. 1 illustrates this process. McKinsey and Company [5] has listed some positive reasons for scenarios, as well as some traps, as follows:

- Powers of Scenario Planning: Expand your thinking; uncover inevitable to near-inevitable futures; protect against groupthink; and allow challenging the conventional wisdom.
- Common Traps: Do not rely on excessively narrow set of outcomes; do not use a single variable; do not become paralyzed by findings; and do not discard scenarios too quickly.

McKinsey [5] also recommends, as do most, a minimum of four scenarios to assure that the organization fully understands the uncertainties over the entire range of possible outcomes. Ragland [6] lists items to beware as well. Included in his listing are the following to avoid: overestimating the ability to control the future; accepting expert opinions blindly; not taking the time to do a good analysis; not adding enough pairs of "innocent" eyes; and being controlled by the tyranny of the present.

There are several ways to craft scenarios. Two methodologies, combined, [4][7] follow these steps: Identifying the focal questions or issue(s); Environmental scanning – external and internal; Brainstorming critical events; Selecting drivers of change and ranking them; Describing the trajectories of critical events; Determining

combinations of critical events; Building the scenario matrix; Developing scenarios; Presenting the scenarios; Considering the strategic implications; Comparing strategies and recommendations; Reviewing examples. Major drivers of change can usually be found within the following areas: social, technological, economic, environmental, and political.

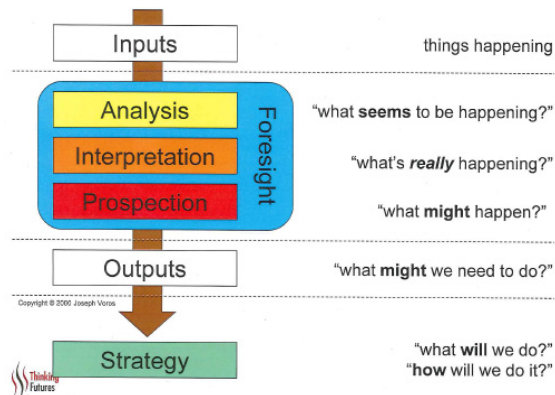


Fig. 1. Scenario planning process [4].

The process is most useful when everything can be included. However, often organizations either feel so comfortable or confident in existing procedures that the possibility of change is really not considered. The failure of the Monitor Group, a prominent firm providing scenario planning services, brings this home. The firm did not apply these principles to their own organization. Several sources site removal of hubris as a benefit to properly conducted scenario planning. In the case of the Monitor Group, this did not occur. In fact, hubris was cited as a prime factor in the company’s failure in a post-mortem analysis. This failure has led to suggestions that it may be best to include the current situation (default belief system) [8] as a scenario. If people are not prepared (or allowed) to be truly introspective, scenario planning use will not truly inform the future directions of that organization.

The number of constraints that are possible in any given situation may be excessive and the complexity of evaluation of any policies escalates quickly as constraints are added. Therefore, most studies have chosen a limited number of constraints. For example, a recent excellent report [9] studied thirty-five proposed energy policies for the US. The measures of success were only two: changes in gasoline prices and reductions in greenhouse gas emissions. While this was not in itself a scenario study, it could easily have been part of one.

Scenarios may be formed at one extreme by pairing the best possible outcomes while at the other extreme pairing the worst possible outcomes. Fig. 2 illustrates the classification of events by both uncertainty and impact. The solid stars indicate regions of biggest concern due either to high impact and/or high uncertainty.



Fig. 2. Classifying Events by Uncertainty and Impact [4].

As one might imagine, the step shown as “considering the strategic implications” is not only a key step, but time intensive to develop the key process outputs. This enables definition of behavior under each scenario and allows development and assessment of the policies, products, or processes that will be most robust.

Shell Oil shares many best practices from its forty years of employing scenario planning. Among these are a few that seem illustrative of the approaches needed, including Tell stories that are memorable yet disposable; Add numbers to the narrative; Scenarios may open doors to understanding; Manage disagreement as an asset; and fit scenario planning into a broader strategic management concept.

4. Examples of use within energy sector

Examples to be discussed include two organizations who have projected scenarios to 2050, specifically Royal Dutch Shell [10] and the World Energy Council [11]. Further, reference can be made to other countries or organizations employing this powerful tool.

The Shell 2050 results are based upon three expected “realities”:

- There will be a step change in energy use as other countries begin to come online
- Supply will struggle to keep pace with demand
- Environmental stresses are increasing

Will countries **Scramble** to secure their own energy supplies OR will new **Blueprints** emerge from various coalitions between societies and governments or other organizations? These two names are useful and descriptive of the two scenarios developed by Shell.

The World Energy Council 2050 scenarios are two in number:

- **Jazz** scenario – Focus on energy equity with priority given to individual access and affordability
- **Symphony** scenario – Focus on achieving environmental sustainability through corresponding policies and practices

These scenario names are meant to be descriptive of the scenarios. A jazz ensemble is more likely to feature individual differences, while a symphony performs by close integration and collaboration. Major findings from these scenarios include the following: In 2050 energy mix will still have major fossil component (specifically about 78 percent of total energy produced within the **Jazz** scenario and 58 percent in the **Symphony** scenario); Energy efficiency is critical; Regional priorities differ; Energy policy should assure that energy and carbon markets deliver; Energy markets require investments and regional integration to best serve consumers

Note that both these studies present only two scenarios, although best practice suggests that four scenarios is a preferable construct. Fig. 3 shows such a typical grouping of four scenarios.

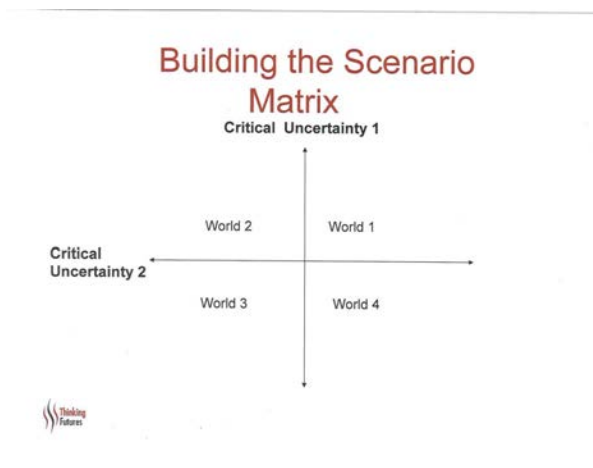


Fig. 3. Typical Four Scenario Matrix [4]

5. Conclusions and thoughts for future use

Some specific topics currently changing rapidly may be factors in scenario planning. Examples include the current debates between home solar and the electric power industry and energy storage in a rapidly evolving field.

This process can be applied to individual industries, as well as to integrated endeavors. This approach would be most useful to those organizations who are trying to sell products and/or processes. This might include different portions of the renewable energy industry, for example, solar, wind, geothermal, biomass, and others. Further, baseload energy sources could be studied from the standpoint of the owners, including fossil fuel and nuclear power generation. The author believes that application of scenarios can be made to practices such as life cycle sustainability analysis, resilience, asset management, and risk management. These areas overlap and can be done in parallel. This position is supported by a recent study linking sustainability and resilience [12].

Scenario planning is an established and potent procedure for viewing plausible futures. Given future uncertainties, as well as the numerous driving forces at play, policy makers need to change their dialogue. This tool must be taken as a particularly useful means of doing that. Future works needs to document such uses, noting difficulties and successes. While some authors, such as Chermack [13] have begun to research these procedures, most merely report on the procedures and results. As scenario planning hopefully begins to be used by policy bodies, their success can be based on such continuing research.

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