

# PROGRAM COMMITTEE B (PGC B) STRATEGY

## 2050 NATURAL GAS PROSPECTIVE STUDY METHODOLOGY



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# STUDY AIMS AND POSITIONING

This study aims to identify technology impact scenarios on the gas market by 2050, and thus focus on very long term future issues and assess technology disruption possibilities.

The 2050 Gas Prospective will:

- Analyze the role of technology and innovation in terms of the gas industry's ability to meet future challenges and its market impact (supply – unlocking new supply sources- and demand sides -efficiency, energy mix, etc.-).
- Identify long-term future signs and signals.

This study will be based largely on expert opinion. A structured approach will be required, with experts consulted and their views collected and analyzed.


# PROPOSED APPROACH

## NATURE OF STUDY

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- Technology related
  - Supply side as well as demand side
  - Broad, requires wide range of specialties
  - Complex, interreactions among many aspects (policy, economy, environment, technology)
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- Requires experts opinion
  - Necessity to provide a structured group communication framework

Delphi Surveys have been widely used in forecasting studies for various aspects : technology, economy, policy making, etc.



***“Delphi may be characterized as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem.” \****

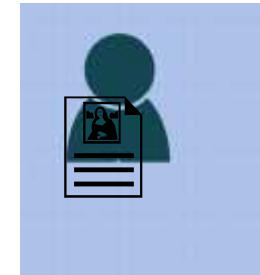
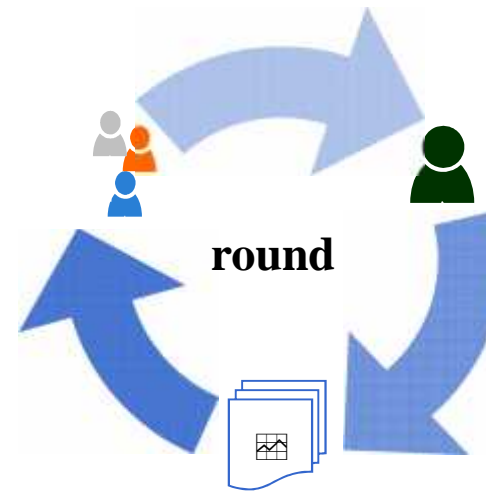
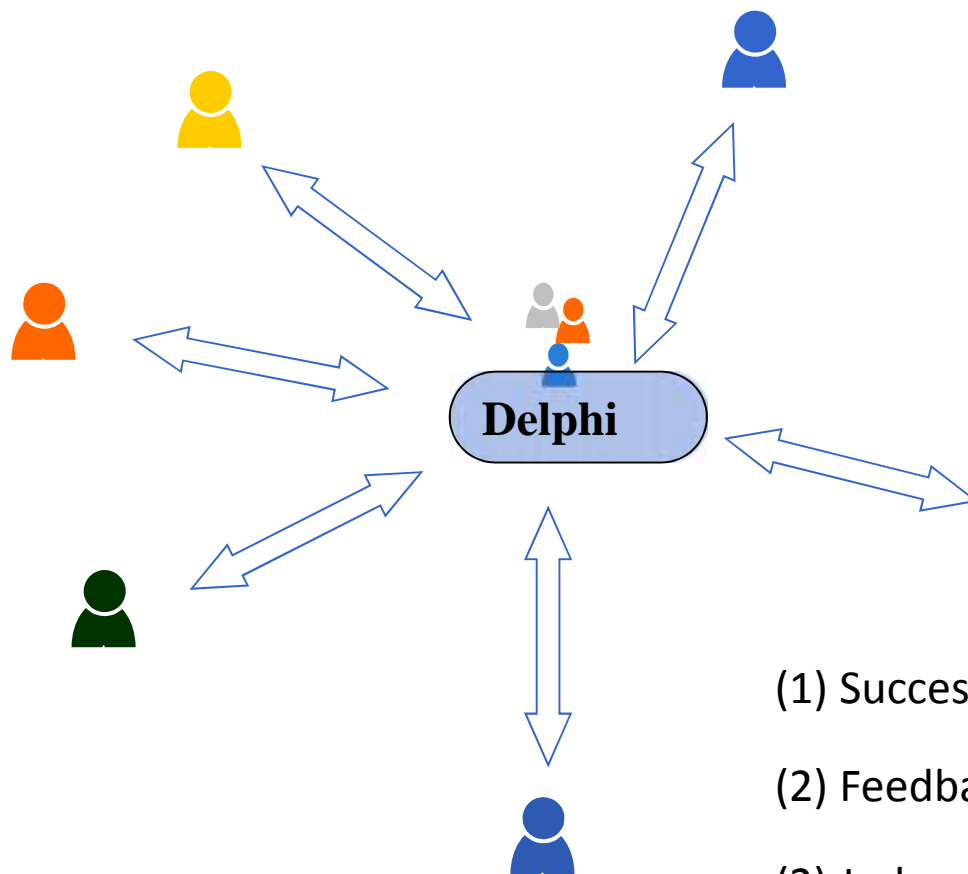
# WHAT IS THE DELPHI METHOD ?

## DEFINITION OF DELPHI

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Delphi can be defined as “A *group communication structure used to facilitate communication on a specific task. The method usually involves **anonymity of responses, feedback** to the group as a whole of individual and/or collective views and the opportunity for any respondent to **modify an earlier judgment**. The method is usually conducted asynchronously via **paper and mail** but can be executed within a **computerized conferencing environment**. At the essence of the method is the question of how best to tailor the communication process to suit the situation. The Delphi method was originally developed at the RAND Corporation by Olaf Helmer and Norman Dalkey”.* (Murray Turoff).

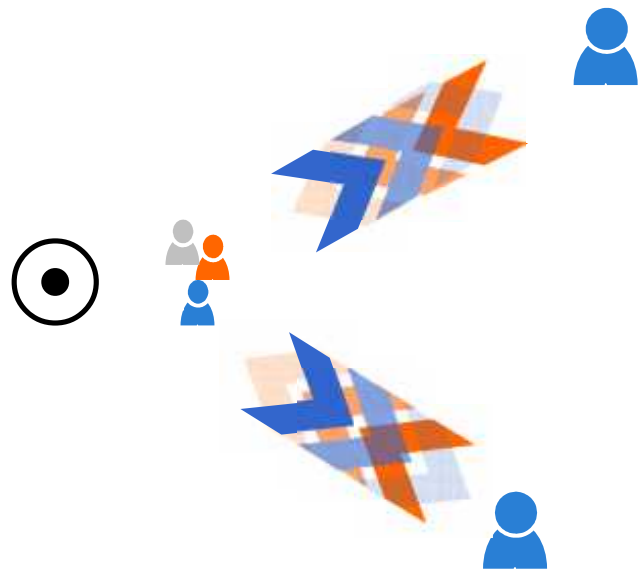
# CHARACTERISTICS OF DELPHI



- (1) Successive questionnaires
- (2) Feedback to participants
- (2) Judgment or assessment of the group vision,
- (3) Opportunity for the individual to update its opinion and,
- (4) Confidentiality and anonymity of individual responses.

# CONCEPTUAL STEPS

Linston and Turoff define four general phases throughout the Delphi process.

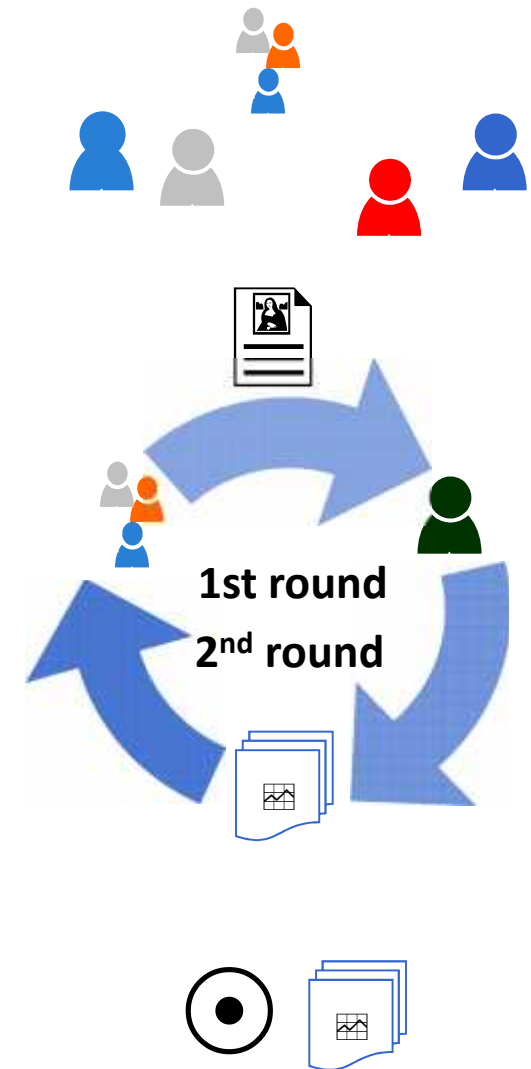


- 1<sup>ST</sup> STEP : exploration of the subject under study. where each individual brings additional information it deems relevant to the topic.
- 2<sup>nd</sup> STEP : common group perception of the subject (points of agreement and disagreement, meaning of words such as desirable, feasible, etc.).
- 3<sup>rd</sup> STEP : exploration of significant disagreements. highlight the reasons for these differences and possibly assess them.
- 4<sup>th</sup> STEP : final evaluation. all previously gathered information analyzed and returned to the consideration of the group.

# OPERATIONAL STEPS

On the operational point of view, Fowles defines the following ten steps

- 1) Formation of a team to undertake the Delphi on a given subject.
- 2) Selection of one or more panels to participate in the survey.
- 3) Development of the questionnaire for the first round.
- 4) Test the questionnaire for the appropriate choice of words (eg, ambiguities, impreciseness).
- 5) Transmission of the first questionnaires to the experts.
- 6) Analysis of the responses of the first round.
- 7) Preparation of the second round questionnaires (and test if necessary).
- 8) Transmission of the second round questionnaires to the panelists,
- 9) Analysis of the second round responses. (Steps 7-9 are repeated as desired or necessary to achieve stability in the results).
- 10) Preparation of report by team analysis and presentation of the findings of the exercise.






# APPLICATIONS OF DELPHI

As a process of communication, few areas fall outside the scope of Delphi.

- technology forecasting,
- planning,
- strategic foresight,
- modeling,
- policy debate,
- Development of a causal economic or social phenomena,
- ...



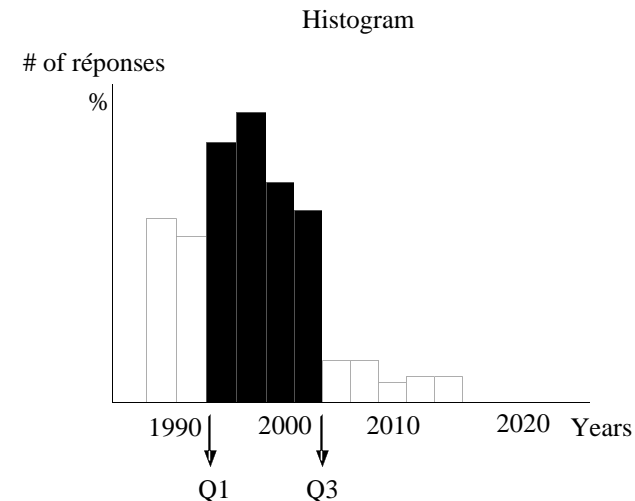
*At the essence of the method is the question of how best to tailor the communication process to suit the situation*

# COMMUNICATION PROCESS DESIGN 1/3

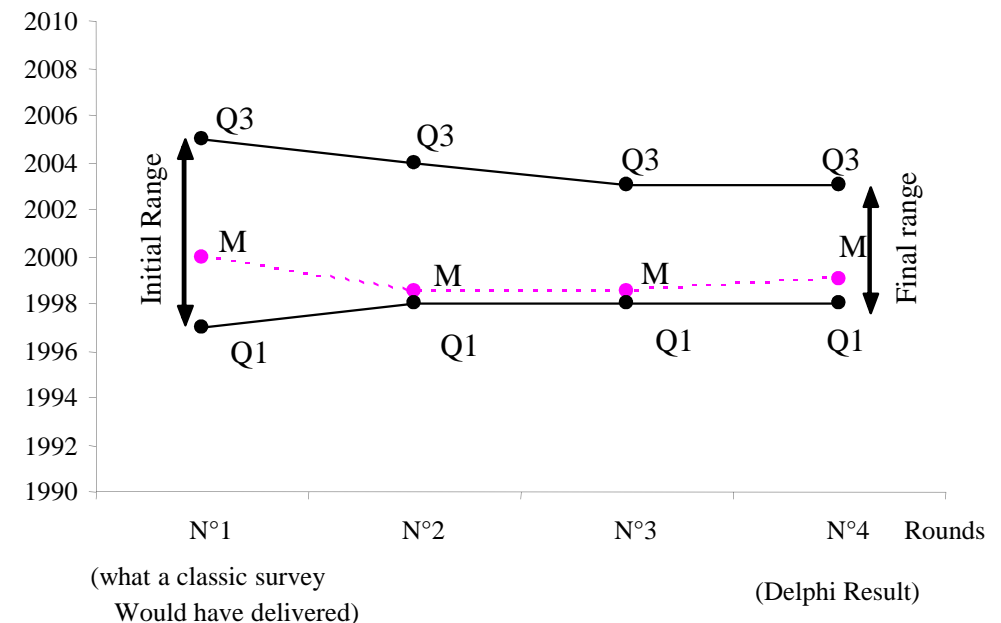
## 1. CLASSIC OR CONSENSUAL DELPHI

- The questionnaire includes closed questions about a forecasting variable (prices, demand, year of breakthrough technology, etc.)
- Each round involves feedbacks to experts of survey results, and a new questionnaire giving them the opportunity to change their opinions and to explore the differences of view.
- As an example, the following graph gives the final results of a survey question asking about the year where the revenue will double compared to that of 1984 in constant terms. The second graph shows the narrowing of the range of responses along the four rounds of the Delphi survey.

Question : In which year, the annual revenue will double compared to that of 1984 ?



Extrait de R. Saint-Paul et P.F. Tenière Buchot (1974),



# COMMUNICATION PROCESS DESIGN 2/3

## 2. POLICY DELPHI

### DESCRIPTION

The Policy Delphi aims to generate the most possible opposed views on a potential resolution or an important policy issue. It can be used for this purpose as a precursor to the work of a committee. Once all the options identified, their pros and cons on the table, a small committee staff can use the results to formulate the policy required.

#### Communication framework of the Policy Delphi

TYPE OF ITEM	VOTING SCALES	RELATIONSHIPS
Option	Desirability Feasibility	Alternatives
Argument	Importance Validity	Pro or con to a given option Opposing to other arguments

### COMPONENTS MANIPULATED BY EXPERTS

- (1) **Options.** Options can be almost anything: actions to be taken, goals, criteria, solutions or decisions. Each expert may propose options.
- (2) **Arguments** can be added and associated with an option to support it (pro) or reject it (cons). Arguments can be related if they are opposed.
- (3) **Voting scales.** The vote is used to distill the information and options to quickly distinguish convergent ones from those on which opinions differ. Participants can vote on the options by specifying their degree of desirability and feasibility. The vote on the arguments is made on their importance and validity.

# COMMUNICATION PROCESS DESIGN 3/3

## 3. TREND DELPHI

### DESCRIPTION

This model begins with the choice of a trend of interest for the group. This can be the volume of natural gas consumed for heating in the next five years. It is a planning framework commonly applied in business planning. This model aims to produce a group vision for the future and an action plan to guide the decision making towards a desired direction or the fulfillment of this vision.

#### Communication framework of the trend Delphi

TYPE OF ITEM	VOTING SCALES	RELATIONSHIPS
Assumption	Validity	
Actions	Desirability	
Measurements	Scope / importance	

### COMPONENTS MANIPULATED BY EXPERTS

- 1) **The trend(s)** is a variable (or a set of variables) of the study to be forecasted by experts.
- 2) **Assumptions** are facts related to the forecast that will happen. Uncertainties are facts that will not happen. The discussion will focus on uncertain facts to derive actions for the controllable ones and measurements for the non controllable ones.
- 3) **Actions** are then proposed to control the assumptions that can be influenced,
- 4) **Measurements** or observations are proposed to monitor assumptions.
- 5) **Voting scales** are used to classify assumptions according to their degree of validity, the actions according to their degree of desirability, and measurements according to their scope or importance.

# SOME EXAMPLES OF DELPHI

## Technological forecasting activities in Japan \*

Japan started its development in science and technology later than other countries but was nevertheless quite successful. Many factors contributed to this success—and one of them was the adaptation of large foresight studies at the end of the 1960s. In Japan, the Science and Technology Agency (STA), among others, in 1971 started to conduct a large study on the future of science and technology. The Delphi method was one technique used for foresight activities. This was not considered a tool of prediction but an instrument to systematically look into the long-term future. Among the aims of this type of national activity is the identification of areas of strategic research and of generic technologies most likely to yield the greatest economic and social benefits. Although many countries stopped their national foresight activities in the 1970s, the Japanese Delphi process continued and was applied every five years. In 1997, the sixth study was finished. Yet, Japanese technology policies are less consistent than is commonly believed and involve an assortment of policy measures and actors/agencies pragmatically devised to address diverse, ever-changing, and sometimes conflicting needs embedded in a broad range of issues. Forecasting results provide the “language” to communicate among Japanese actors in science, technology, and society.

*\* Abstract of Technology Forecasting Activities in Japan - Hindsight on 30 years of Delphi expert surveys, Kuwahara T., Technological Forecasting and Social Change, Elsevier*

# SOME EXAMPLES OF DELPHI

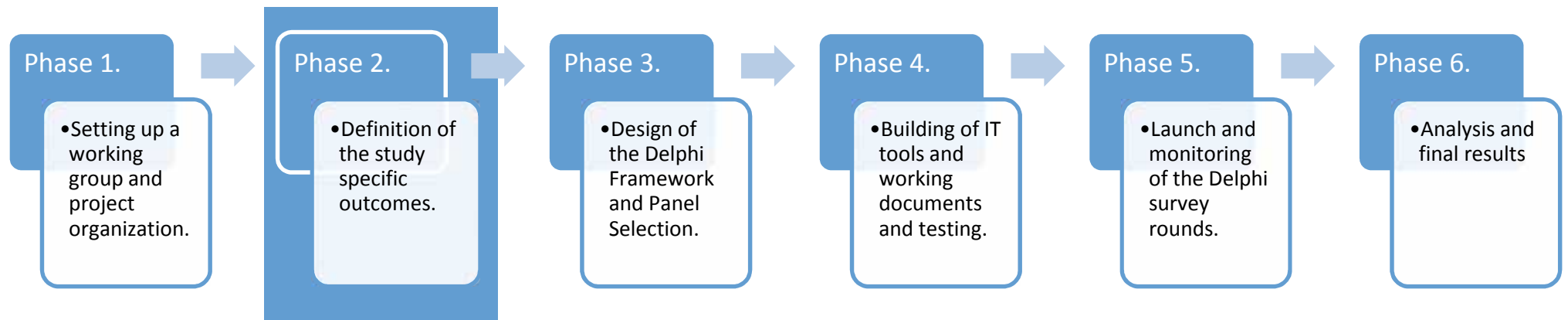
## Real-Time Delphi Studies, by The Millenium Project

The Millennium Project was founded in 1996 and is now an independent non-profit global participatory futures research think tank of futurists, scholars, business planners, and policy makers who work for international organizations, governments, corporations, NGOs, and universities. The Millennium Project manages a coherent and cumulative process that collects and assesses judgments from over 2,500 people since the beginning of the project selected by its 40 Nodes around the world. The work is distilled in its annual "State of the Future", "Futures Research Methodology" series, and special studies.

The Millenium Project has also helped many organizations conduct future studies :

- World Bank supported a review of the Resource Allocation Framework of the Global Environmental Facility;
- UNESCO used it for initial planning for the United Nations World Water Development Report;
- Peru's Energy and Mining Supervisory Agency explored possibilities for the 10-year future of electricity;
- Millennia 2015 assessed developments and policies to improve the status of women; and the
- World Federation of UN Associations studied current relevance and issues of the Universal Declaration of Human Rights.

# ORGANIZATION AND PHASING



## Contribution of the IGU WOCs and PGCs.

- complementarities between Study Groups,
- outcomes could be inputs for study groups,
- use the outcomes as a good motivator,
- valuable resource to define the best value added expected outcomes possible.

So, basically, 3 steps to define outcomes:

1. Define the technological issues related to the study groups studies,
2. Determine the specific technologies to include by screening the high impact high uncertainty ones, by the mean of a voting procedure among the group members,
3. Define the final specific outcomes in forms of specific questions to ask the panel.