AFTERNOON SESSION

WHAT TO DO NEXT - A program for discussion

The program proposed for Euratom is best resumed by the table giving the gross subjects of research and the people engaged, for a five year plan.

The scope of this program is :

1) Make a thorough exploration in search of new processes, with the aim of digging all them out.

2) Make a detailed research around the process Mark-1 to prepare all the data necessary for designing a pilot plant and evaluate as far as possible, the cost of the process.

3) Keep in contact with the people designing HTR's in order to inform them of the weight the caracteristics of the heat source can have on the optimazation of the chemical plant, and vice versa to be informed on the trends of HTR's characteristics in order to adjust the chemical process to them.

We think that the developments stimulated by the possible use of gas turbines will lead HT Reactors in the right direction from the point of view of "direct" processes : Higher T and shorter Δ T.

MARCHETTI-
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Developing "direct" processes for H_2 production

Effort indicated by people engaged

	1970	1971	1972	1973	1974	% indicatively
1) Direction and coordination	2	2	2	2	2	10%
2) Economical analyses, flow sheet and process optimization	4	6	6	6	6	
3) Search for new processes	10	10	10	10	8	10%
4) Chemical reaction studies (equilibrium, diagrams, kinetics eventually catalysts)	13	21	27	24	20	20%
5) Materials (selection, corrosion tests, embrittlement, creep; if necessary development of ad hoc alloys)	16	26	39	39	39	30%
6) Unit operations	5	20	31	34	35	25%
Total	50	85	115	115	110	

Mean effort over the five years 95 persons

Chemical Engineering and Pilot Plant Construction and Operation should be subcontracted to an external firm.

M. Marchetti

Well, I would like to take again a concept that Mr. Caprioglio did expose this morning.

Up to now and up to a certain point we have been in a closed shell, a sort of ivory tower and the last decisions of the Ministers pointed towards larger and deeper collaboration between our research center and industry. This is a first experiment we have made calling representatives from the most important, let me say energetic industries, in Europe, to find a mechanism for improving these connections or, better, for starting them because improving supposes that we had good interactions before.

There are a certain number of mechanisms through which the collaboration can find place. One of them is to meet from time to time on specific topics and talk. This is the simplest and up to a certain point can be quite fruitful.

The next step would consist in having a more engaged collaboration: to exchange people between us and industry ; again on specific topics. We have formal mechanisms for doing that, we can take people from industry; the Commission pays up to a certain point for the expenses; there are rules for sharing the know-how that can be acquired in this interaction. As a third step industry can commission work; we are now trying to find a good mechanism to work for industry, using the center as a kind of Battelle.

Well, coming back to our case we have a specific topic at hand. We did present a program, I mean the Commission did present about six months ago a program for the next five years and in the pages you find on the table there is the essence of this program: what are the scopes and what is the effort we think neces-

sary to get at them. Perhaps we can read this scheme together, and I would like to have your reactions on the technical part of the program, I mean if you think that the effort might be considered too large or too small or unbalanced and we like to have your reactions on what kind of connections can be realized between industry and ourselves on the specific subject.

Well, we can go to the text of the program. The scope is what we have seen this morning; we did present a very specific possibility for producing hydrogen. I guess from private conversation that everybody agrees that the general frame is correct. There are many possibilities. We have to explore them more thoroughly than just saying: well, that is thermodynamically possible. This is the first scope of a possible research.

The second is that we must have a reference process to work out in a more thorough way so that all the problems come out in detail and can be evaluated.

And the third point is that our source of heat we did assume as quite independent of the process, in fact interacts with the process in the sense that heat at a certain temperature is more or less difficult to produce than heat at another temperature and has more or less value for the process. We must have a global optimization.

These are then the three main points :

- to dig out all the processes,
- to study in depth one of these processes,
- to start interacting with the producers of heat.

For us the producer of heat is a reactor but it might also be a producer of fuels. Well, in the second page

we give a distribution of the effort over the various items and exactly the same table appears in the program that the commission did present to the Ministers about a year ago.

We assume that we should put on this job something around 100 people; they are all technical people; for a five years period. The objectives are indicated in the list at left : 10% of the effort should be devoted to contact with the economical field: economical analysis, flow sheet and process optimization; 10% of the effort for digging out new processes and 20% of the effort, as a mean for the 5 years, for examining in depth all the problems of kinetics, equilibrium diagrams, catalysts if needed for the various reactions, and 20% of the effort for materials.

We are aware that the greatest problem in designing such a plant is going to come from materials, high temperature chemicals tend to be reactive; the more reactive, the higher is temperature and the tendency here is to go to very high temperatures to improve the thermodynamics of the process and to extend the range of the processes which are available.

The last point refers to a study which is pre-engineering, as unit operations, we must see if for instance a certain reaction runs well in a suspended bed or something like that. But, as the note at the bottom of the page clearly warns, the final chemical engineering and pilot plant construction and operation should be subcontracted to an external firm, this means that we are going to prepare all the material that a designer is going to need for designing a pilot plant or a prototype, and we try to do that in this five years period, at last for the process Mark-1. This is very briefly and very essentially the presentation of the program.

Now I would like to have your recations first, on the dimensions of the distribution of the effort and second on the possibility of a stricter collaboration between us and industry.

I must say that 100 people can be a small number or a large number. I take one element as a reference: the market for hydrogen has a dimension that is not very different from the point of view of primary energy from the market for electricity. And for developing competitive plants in the electric field starting with nuclear energy, the number of people involved can be counted in term of ten of thousands, so I think that 100 people for digging into a field which has the same size can be considered as a modest effort.

M. Weyand

With reference to pg. Nr. 1, I think it is very good that you try to make such explorations of new processes we have heard already this morning and are looking for higher temperature available in the near future and all these things. To point Nr. 2 I think it very useful if you want to execute a detailed research on the process Mark-1. But I think it should be clearly only in the laboratory stage not beyond the laboratory stage. Point 3 seems very interesting because you want to be in contact with the people working in the field of high temperature reactors. Most probably the German Government will promote KFA Jülich, Bergbau-Forschung and Rheinische Braunkohlenwerke for the first step in the utilization of nuclear heat. That means that the knowledge being gained by KFA will be up to a certain degree available for Ispra and it seems very useful if there were strong contacts between them both.

I think it may be very useful that Ispra orders an engineering study that is executed by industry or even by consulting engineers. The aim is to come to better cost calculations. Although it will be a rough calculation of course. Perhaps such a study should be ordered in one year. Another problem which doesn't seem quite clear to me, is what shall be done with the title 1: design for a pilot plant. In my opinion, if such an order is given, I would prefer that this order is given by an industrial company, if there is one. But anyway, we have a lot of time up to this so we can postpone. Now going back to pg. 2, point 1, direction and coordination, there are no remarks but point 2: economical analyses, an I had mentioned just before, I think it better that this point shloud be executed by industry or even consulting engineers because there are a lot of industrial practice involved. This practice is of course not available in a research center, not in any research center. With point Nr. 3 I completely agree, point Nr. 4 too, point Nr. 5 also. But I don't understand clearly what you have meant with the unit operations. I think it's just beyond the laboratory stage, isn't it?

C.Marchetti

Yes, you see, to make a pilot plant you need not only information about the reactions, but also about the ways you can handle these reactions, and the construction materials. These units operations are, in our mind, small apparatus for assessing a possibility; for instance of running a certain reaction in a suspended bed. A suspended bed can have 100 liters volume or something like that. We intend to stick to the practice of not going beyond the laboratory stage, because it is not our scope after all to enter into the field of industry. On the contrary, we have the tendency of sticking too much to

laboratory practice. In this case we are in fact trying to make an effort for going toward industry.

M. Weyand

I don't understand clearly this point Nr. 6 What do you want to do ?

M. Marchetti

You see, a pilot plant is something where we run all the processes continously and all together. Unit operation is a small piece of this general plant which is tested for itself. An individual step.

M. Weyand

An individual step. Maybe components or such things.

M. Marchetti

Maybe components. Materials and components are linked to a certain point and testing the corrosion of materials is not enough. Sometimes you have to have materials in form of tubes for instance and then to run the chemicals into the tubes. That is what we understand by unit operation. A small piece of a large apparatus.

M. Weyand

I think perhaps it may be better to postpone the point No. 6 after 1975.

M. Marchetti

You see, one can have a sort of sliding program. We can start unit operations when the need presents itself, and we can put the people earmarked for unit

operation in the chemical reaction studies and in the materials. And then shift them in the unit operation business when the need comes.

M. Franzen

In any case unit operation only appear reasonable if it is clear what kind of steps or what sequences of steps are used and what kind of units really are to be used. In any case unit operations are coming far behind all other developments. Maybe that you can't decide from the very beginning, how all the details can be fixed, but some can be fixed. For these details or these steps already fixed you can start a unit operation even earlier, because you see, that, in any case you have to use that step. Otherwise you have to postpone unit operations until it is definitely clear what you finally want to do.

C.Marchetti

Yes, we are aware of these problems and for this reason such a point is in last position.

M. Franzen

There is no need for all unit operations to be the last. Maybe some come earlier.

M. Marchetti

And some are growing faster, because we don't know yet if ...

M. Höhne

That's why I want to propose to rule the point No. 6

M. Marchetti

Well, the rule it out completely it's sometimes dangerous. We can put p.m. but leave the name unit operations p.m. you see means it is there as a concept and then we can put some people into it taking them out from other operations. If not, we have to go to the

Ministers to have accepted that we can assemble a few pieces having a fluidized bed somewhere.

M. Weyand

To speak frankly, if you go to a Minister I think it would be better to have the point 6 ruled out. Therefore this is my proposition.

M. Marchetti

However, I guess you agree on the general size of the effort.

M. Weyand

I don't know whether it is useful now to keep in under point Nr. 2 the flow sheet and process optimization, what do you think about it, Mr. Höhne?

M. Höhne

I agree with you, you better increase the number of people searching for new processes because you see you are already sure that you will have temperatures available in the range of 1000 degrees C. Under these conditions the process may become somewhat cheaper on the construction side. This would be a great benefit because, as I already turned out before lunch, the price will mainly depend on the fixed costs and only comparatively little from the energy costs. So at the beginning it will not matter too much whether you have available nuclear heat or fossil fuels. Your hydrogen price will be mainly determined by the fixed costs and the decrease of these costs is of overriding importance.

If it turns out that the fixed costs for this mercury process are three times as high as for the common gasification processes, you just can forget about this mercury process. You can only use this process as a theoretical model to learn how to handle these reactions.
The staff developing new processes should therefore be increased to a maximum in order to enlarge the scope of new applicable processes.
A total of 15 persons is quite alright. May I know further details on point 3 ?

M. Marchetti

I would like to answer about the question of economical analyses. It is certain that they are best done by industry. On the other side we need a very strict interaction between people doing the economical analyses and flow sheet optimization and people doing other researches because optimization defines what are the fields of interest. So, in my opinion , the best thing to do would be that people from industry specialized in this kind of operations are detached here in Ispra for a certain time....

M. Höhne

The reason why Dr. Weyand suggested that the flow sheet and pertinent data are elaborated by the industry is that in a larger engineering company, you have 1000, 2000 or 4000 people working in quite different fields. At the beginning you have just to assume that all these theoretical concepts will work in practice and on the assumption to design your equipment.

Assuming that it makes two seconds for a certain reaction to develop, you have to calculate the dimensions according to this reaction time. You always need experience from other processes for the development of a new one. Now if you have a company which works on 2000 different processes you can select a corresponding number of experienced experts. If you are the engineer concerned with the elaboration of a flow sheet and the calculation of the technological data of a specific process you can consult each of these specialists for a maximum of half an hour but you cannot bring them to Ispra because they earn their money by selling knowledge.
The result of our industrial study will be an adequately motivated flow sheet and a description of the process to be developed.

M. Marchetti

Yes, I agree with you. The problem is a problem of transfer of information and we have to decide if it is easier to transfer information from the people doing the chemical and materials research to the men in the industry or vice versa by transferring the information which is into industry to these people; so the choice of the position where the men doing optimization is, is a kind of another optimization. You say that is better in industry.

M. Höhne

This is possible only in industry. I fear. On the other hand, the search for new processes is of course better done in such an institute as yours because there is a better psychological approach.

M. Weyand

Then I would propose that the point Nr. 2, is ruled out too.

M. Marchetti

Let me say that we can put No. 2 and No. 6 at the end writing that this kind of researches can be sub-contracted to industry.

M. Höhne Yes

M. Weyand Yes

M. Marchetti

It is exactly what you say but we must leave it there because finance has to come from some places and if it disappears money disappears.

M. Franzen

I would also say that all the points 1 to 6 should be listed in order to make a complete view on the work that has to be done to the final end. This need not necessarily say that all these 6 items have to be done by the same institution. This is a matter of a later decision.

M. Marchetti

Well, certainly, our plan is long term and it is risky, so the institution for the moment being more suited for furthering it is an international institution like our one, the philisophy can be discussed but this is just in the back of the mind when one sets up an international research institution , i.e. to avoid multiplication of research which is risky and long term. Naturally we have the ability to do it, we have chemists, metallurgists and it is useful in my opinion to keep them together with the people studying new processes because they have to interact quite strongly, you see.

M. Gallone

Well, I would not share completely your view about point 2 and especially point 6 because it is true that

some sort of large equipment and at quite an advanced development stage might be successfully handled by industry.
But I understand that here the problem is the problem of development of comparatively small pieces of equipment just to stress what the main problems might be and I'm afraid that the step from the purely theoretical or laboratory study of the chemical reactions involved and the step of the industrial equipment might be a little bit too long to be covered just by industry. I think it would be wiser to think of a sort of intermediate solution which might contemplate the detachment of people and some kind of liaison with industrial offices. I would rather suggest that kind of approach rather than deleting these points. I'm afraid we are going to rather uncoordinate type of work in that way.

M. Weyand

What's the difference between pilot plant and unit operation work ?

M. Gallone

Ah yes, as I would see it, unit operation is mainly concerned in building a unit equipment of a certain type which may be a small unit in terms of output but must have a certain technological significance , it must stress what the problems are with materials and so on.

M. Weyand

But materials studies are a point by itself.

M. Gallone

Yes, but what happens when you put the material studies together and you actually run the equipment? It has to be tested first for critical equipments on

a rather small scale and possibly with cooperation of some of the people which has been involved in the previous work.

M. Weyand

I don't know what you mean about small equipment in this case but I think the following can happen: that in the next years there will be a great interest of industrial companies in a title one design and even to build a pilot plant. In this case it might be useful that an industrial company would give orders for unit operations. You must remember it can happen that in one or two years the components, in the view of today, will have changed completely. So it would be wise to postpone this point unit operations at least for 2 or 3 years by these reasons I just have mentioned.

M. Höhne

Besides, the intensification of the search for new processes and in particular chemical reaction studies are of permanent value.

M. Marchetti

Perhaps, you see, to try to find an adjustment between clear cuts and perfect smoothness, which are the two points of view, we might try to have an adjournment committee that meets every year or something like that, deciding, because it's difficult to see into the next 5 years, to make a program very precise. Every year they decide where the limit is, shifting it according to the previous experience, so we have the mobility and we are not blocked by too many a priori decisions.

M. Höhne

At least the number of people is right.

M. Weyand

The number of people is right.

M. Frenzen

Well, I think this list here of points, mainly 2,3 and 4, even including 5, does not mean that these points are following exactly one behind the other, the second, the third and then the fourth, in reality it is so, that these points are intermixed, and as soon as you have found a process or a process combination, which seems to be better than that you have in mind now, Mark-1, you have to do a little bit more of process optimization and see, well, it is really worthwhile to follow that one or not. So in reality these points 2 including 5 are running to a certain extent simultaneously.

M. Marchetti

In fact, you see, the years on top show that the operations are running simultaneously in practice, but the shifting from one action to another has to be decided year by year, giving an envelope for the total effort. For that reason I would propose to have an advisory committee for discussing the results and deciding or, at least, advising, for the next year operation. The committee can meet, once a year or twice a year or something like that.

M. Weyand

I think it might be wise to start on a small basis. It would be very useful in this case, ans on the other hand it might be very useful to look for strong links to industry.

M. Marchetti

Yes, Yes, the point is to find what is the small basis. As I said before, I think that 100 people to

penetrate a market which is comparable to that of electrical energy mean a very small scale effort. So I think we are in this small scale and it is modest enough to be accepted.

M. Höhne

Of course, it's one million $ a year.

M. Marchetti

This is a small scale at least at a level of nuclear energy. Nuclear energy in Europe costs something around a billion $ a year, thousand times such a figure.

M. Franzen

But I think we should stick to the general concept: a combination of chemical processes has to be found in which to introduce high temperature energy from a nuclear reactor. This investigation for the right processes and their combination can be done easily with chemical or industrial companies. They have small scale equipment and facilities available to do it. For instance, the concentration of hydrobromic acid is a very easy question as such. There are methods to concentrate this type of material, they are quite known now, not in all details regarding this special problem, but the equipment and facilities, everything is already available. Also the construction groups of the chemical industry or the engineering companies which we have, for instance, in our European countries, should be capable to develop and investigate processes of this type completely by their own experience and they only have to be given a certain direction in which to go.

M. Höhne

They actually need more : they need of course the chemical reaction studies, equilibrium studies and so on.

M. Franzen

I think from the view point of testing materials, testing equipment, testing process; how they practically perform ;....

M. Marchetti

Our idea would be to have a rule book; to prepare a rule book so that a plant can be calculated from the book. It's quite complicated to have a rule book, you see, a bridge is a quite simple structure and rule books tell 80% of the truth. However... Other comments? Well, so perhaps I can deduce from your reaction :

1) that the general size of the effort is reasonable,

2) that the distribution of the tasks can be discussed according to the evolution of the research during the first years

3) that a certain number of tasks have to be shifted as soon as possible to industry.

Well, they are the three conclusions. Everybody agrees?

M. Höhne

I mean also that for the three: search for new processes it will be better if you have first more people on this field and later not so much.

M. Franzen

Yes, in order to come as quickly as possible to a decision in what direction to go, under what combinations of processes to select, otherwise we will go a certain way and later then we find this is not the right direction, and this will produce a loss of money and time.

M. Marchetti

Your question is quite correct, but it's quite tricky to organize descoveries. First it is difficult to find

the right people for inventing processes and if you have three of them it's not much use having a fourth one if he has not the proper kind of way of thinking. In my opinion the most important limitation in the effort for finding new processes is the number of people that you can devote to this task, you see, and second, discoveries are quite a statistical process which is going on almost stochastically for a certain number of years and this is for 5 years I would say that after 5 years you can stop perhaps this kind of research, but I think adding one man is not of great importance, because as I told you the limitation comes from the number of men we have available. We are certainly going to put on the search for new processes all the men which are capable of doing that.

M. Block

I think it is better to proceed systematically to reassure oneself there are no other processes which are more attractive, before one tackles the question of technical feasibility.

For this reason it seems to me that far too few people are to be engaged on point 3 in the first years, as compared with points 4 and 5, and also with point 3 in the succeeding years.

One should not commit oneself directly to one invention even when hopes are high that the right process has been found.

M. Marchetti

Well, you see, you have to mix something between systematics and invention. You can't find everything by systematics only, because if you lose perhaps a little hook then you lose a certain amount of possibilities and you can't rule out systematics because if not you don't know when the field has been exhausted.

so one has to work empirically using a bit of systematics and a bit of ingenuity, to explore the system most economically. Our first process e.g. has not been found by a systematical approach, nor the second.

M. Block

I think we should examine it as systematically as possible.

M. Marchetti

Yes.

M. Franzen

In any case in looking for new processes it is not necessary in my opinion to have a great number of high ingenious people working on that. It may be sufficient to have 3 or 4 very highly ingenious people, which have a certain number of trained chemists, or other trained people on this special field which are working on certain limited searches and certain limited ways which the 3 or 4 tell them to go. This is a normal method and this means that it is probably not necessary to spend the search for new processes with the same number of people engaged over the whole time of 5 years, but to concentrate a bigger number of people more in the beginning and then to decrease it. Otherwise you would state, well, at the end of 1974, when the final decision what processes to be chosen should be made that still then you have 8 people working on search for new processes.

M. Marchetti

Can you give us in your opinion a kind of trend for the 5 years period?

M. Franzen

If you stick to the same 48 men.years you concentrate 28 men . years in the first 2 years and spread the other

20 men . years over the third, fourth and fifth year. For instance make it 15 men work in 1970, make 13 men work in 1971, then you have a total of 28 men . years; make 10 men work in 1972 and 7 in 1973 and just leave these 3 ingenious people for 1974.
Otherwise you have to get rid of them.

M. Marchetti

O.K. I'm taking your suggestion and I'm writing here. It is very reasonable, what you propose. The total effort is practically the same.

H. Siebker

I should like to make a very general comment. I suppose if the overall idea is valid, and I think everybody agrees to that, then the search for processes and the general intellectual development will not be a monopoly of Ispra, not even a monopoly of the member countries of the community. I suppose there will be an effort dedicated to this kind of thing on the other places; e.g. we also heard this morning about some ideas which have been developed by Prof. Schulten and his collaborators. I suggest that a good coordination between all groups working on this field should be established which even might be institutionalized in creating a working party, and advisory committee. I might perhaps mention in this context that in the field of direct reduction of iron ore, using processes which make use of high temperature gas cooled reactors, such a working party of a certain institutional character has been created by the initiative of Vice-President Hellwig in May 1969; the starting point of its work was a study, performed under the auspices of the Commission, by a number of institutions and companies (Institut für Eisenhüttenwesen TH Aachen, Società Italiana Impianti together with the Centro Sperimenta-

le Metallurgico di Roma and, for the nuclear aspects BBK and SOCIA). This study concerned a problem which in a certain sense is similar to what we are talking about today, although the respective processes are better known and nearer to commercialisation than "water splitting" processes.

I wanted to make this comment in order to show how a body like the Commission has organized its work in a similar case. I believe that the creation of a working party grouping all those which are taking an active interest in the same matter would also here be a good approach.

Coming back to my example : under the auspices of the main working party, three subgroups have been created: one for processes (that is siderurgical processes in this case), one for reactor assessment (effects of the different processes on the HTGR design and its economical aspects), and a third one, not yet in effect, which will treat the particular aspects of heat transfer and heat exchangers. One of the tasks of these groups will be to define what should be done in the future as far as research and development is concerned.

We can imagine that the main "Working Party" could at a later stage become a kind of advisory committee or steering committee for projects which the Community may want to support in the future. Such advisory committees may, among other things, also advance their opinion as to which portion should be given to industry and which portion should be reserved to national or Community research establishments.

M. Marchetti

Well, I agree in principle with your propostion in the sense that as we said before it could be useful to have an Advisory Committee whose members should have

some direct interest in the good success of the operation, meeting once a year or twice a year for :

1) readjusting the program according to the results,

2) advising about the distribution of work between the center and the industry,

3) assessing the results.

Now the point comes, who should participate in this consulting party. For instance, you are here the representative of the most interested industry in hydrogen production, use, or distribution. What is your reaction? Would you be ready to be represented in this committee and what in your opinion should be the rules?

M. Höhne

I'm not fond of this idea to establish a selected circle. You see, in this circle, the membership should be open. Let's consider three engineering companies which now participate. They would have a certain advantage against other engineering companies which are not represented here and are not in such a close contact with the development here. After all, this development is paid by all people who pay taxes, and so it is not good to give the advantage just to a few. You wrote letters to interested people. We came here. Maybe in the course of next year other people show more interest and maybe you wish to have another group just to get more support and a wider range of experience. So I consider it not justified to take just a few people in such a committee, at least, as far as the industry is concerned.

M. Marchetti

Let's say that you must choose sometimes, if not, how can you run the business? Because there are an enormous number of firms that could be or might be inte-

rested and we can't make a committee with 200 people or 500, or what is it.

M. Franzen

Committee can be changing in composition.

M. Höhne

It should be open.

M. Marchetti

We must avoid a lack of continuity. In my opinion what is important is that information is distributed to the interested parties, but the running of the business should be done by a selected number of people, selected in a certain way and I would like to ask you a suggestion for running the business or for selecting...

M. Weyand

Yes, I think such a group could be very useful just in case one knows correctly the task. If you are only speaking of an advisory group or a working group I think this would be the right aim for us now and I think in such a group there should be mainly representatives of the companies and research centers who do active work in the said field.

M. Marchetti

That's a criterium of choice, certainly, but you see, in that case you lack the competence and the advice of the people which are for instance able in developing the plants, I mean, in using the knowledge. I take an example, suppose that Lurgi Company is not working on this process so it is not represented here, but we will be very interested in having the competence of the Lurgi Co. in the committee.

M. Weyand

Yes, I see, it always can happen that you invite some people who are not working actively in this field if these people can represent a group of companies or a special company. So these gentlemen will make available to a certain degree the experience of industry.

M. Siebker

Perhaps I might comment that, in the example which I gave before we choose the system of "national correspondents". For instance, in the case of the Bundesrepublik it is VDEh (grouping siderurgical aspects) which selects the German members of the working party according to interest and competence of the different companies and institutions; national correspondent of France is IRSID, to cite another example. I agree that the field we are talking about today maybe more complicated to handle as chemical industry is not organized in the same way as siderurgical industry, but the general concept may be similar. As a matter of fact an analogue approach is already practiced by the Commission in the case of the evaluation of application possibilities of HTGR's for the valorisation of fossil fuels.

M. Marchetti

Mr. Gallone perhaps you have a good idea.

M. Gallone

No, I'm afraid not, I think this is a very difficult problem. What do you mean by interested companies?

M. Marchetti

Well, I mean intersted in two things. Interested means

that supposing the process works they take a benefit from it. They can be companies, e.g. designing plants, the interest for them is to sell a plant; companies using hydrogen and they have an interest in purchasing even slightly cheaper hydrogen, or companies producing hydrogen because they can have a more convenient system for making their product. That's the definition, quite arbitrary, and you can select from this group a subgroup made with the companies actively interested in the development. The problem is to reduce the number, to find a criterium for reducing the number. If we have an advising committee of 200 people it doesn't advise at all. Let me say that 10 people is quite enough.

M. Franzen

Yes, yes, it would make it very slow in acting.

M. Marchetti

Very slow in acting and the subcommittee tends to lose the general view, which after all is what we need from the adviser, because how to do the measurement in a certain way we know very well ourselves, but the general view we need first, and second, the contact with industry. This is the scope of the committee.

M. Franzen

Well, any selection in its nature cannot cover completely the whole idea, any selection can be only the second best solution, and you can only try to approach to the best solution by very carefully selecting when organizing such a group.

M. Marchetti

So we should select for efficiency. That's my point of view. Select for efficiency, trying to make the least

number of discontented people.

A very important point is that the knowledge we are going to collect in our research is available to everybody. Anybody can come here, look, ask, write letters and the knowledge will be given to him. But you see when asking for advice I don't think it is necessary to call everybody that is or might be interested. So we have to find a criterium for efficiency to choose properly this advisory board.

The second point is that it must be an advisory body because our rules, for the moment being, can't accept a board that takes decisions inside the institution. Only the Council of Minister at the end decides, you see. However, it happens that we tend to follow the advisers so in fact they decide, but formally they should form an advisory body.

M. Franzen

It's like a good family where the wife is advising but really she decides.

M. Marchetti

That's the point.

M. Paschal

Do you have a certain idea of the possible economy of this process compared with the classical method of producing hydrogen.

M. Marchetti

Well, asking this question we go back to our discussion of this morning you see. The economy exists when somebody is making profit. For the moment being nobody does. Actually we ask people to spend money. Our very schema-

tic attitude is that there is room for the process becoming economic, this is not a demonstration but there is room ... You have the price of the final product. This is something we know. We have the cost of the raw material, heat, and also that we know. The ratio is five. We still need ingenious chemists and chemical engineers but the factor of five is quite something, is quite a high ratio. So we think we can squeeze into this factor of five the efficiency of the process; the cost of the plant, and profits. It is a very generic and very broad frame, you see. However, on this basis we think for the moment being we should go ahead.

M. Höhne

That's quite clear, even though it turns out that at the end you find a process to make ammonia directly in a simpler way than now or something like that. From this type of reactions you will have profit. There is no doubt. So it maybe the result in five years is quite different from what we are discussing now.

M. Marchetti

That's why we are doing research but you see the prize is very high so we can risk. That's our point of view.

M. Franzen

There is a margin ...

M. Marchetti

Not a margin, but, we have a large market in front and we can risk one percent of the potential "chiffre d'affaires" trying to get this market. But we should come back to our problem, how to arrange the system for advising and for promoting ideas... now comes the good idea...

M. Gallone

I was going to put another question if you don't mind. What is meant by an active company? You mean active in the sense that it would participate directly in the reserach group for instance...

M. Marchetti

I would prefer, I would say we put first a kind of ticket for entering into the committee, that the firm has some people, maybe just one, thinking and working on the problem, paid by Euratom or even paid by themselves. It's better if it's paid by themselves because it shows that the interest is a true one.

M. Gallone

It could be possible. This figure of 95 persons refers to Euratom personnel only or it is a target figure to be achieved using Euratom personnel and industrial personnel?

M. Marchetti

I would say that it is more a target figure than Euratom people.

M. Gallone

Well, in that case I think we would fit into a definition of an active company.

M. Marchetti

Do you think Mr. Weyand that such a kind of criterium could be at the same time selective and open?

M. Weyand

Yes for the nucleus of the group of course, and of course in this sense Bergbauforschung and Rheinische Braun-

kohlenwerke fit too.

M. Marchetti

So you think that we might have this criterium of choice with the number of people participating left open up to a point.

M. Höhne

If someone prefers a certain way for instance to use coal, he is no longer free in his mind. If I had a pit of coal I should have to use it. In this case I should of course prefer a process using coal.

M. Weyand

And I think that doesn't matter, because the coal people will always show the weakness in the other system.

M. Höhne

What you need more is not a brake but an engine to make your car run.

M. Marchetti

You need both actually, both are essential. People invited here are quite mixed from the point of view of their intersts, and I'm very glad of this because you can hear the ring of all bells. I'm not looking for people saying yes, yes, a consensus committee, but a committee where ideas can be discussed and where somebody plays the part of the "advocatus diabuli". There should not be 90% "advocatus diabuli", 20% is quite a right proportion.

I'm a bit sorry that I'm taking you in this kind of problems but it's the first time actually that we try to find a better way to interact with industry.

M. Höhne

The idea is in principle right and its up to you to write letters to the different people you like to select.

M. Weyand

To make it quite clear we are speaking of a working group who will sometimes once or twice a year meet themselves and discuss the problems. It is an advisory group.

M. Franzen

I have a question. It has the character of an advisory group?

M. Marchetti

It has too, because we can't have inside the Commission, for the moment being, a group that takes decisions. In fact, we follow the advices, so ...

M. Höhne

But it has to be more than an advisory group actually, it has also to be a link to the people which are supposed to use this process, it is always difficult to find people to carry out the ideas. They all want to carry out their own ideas, and so one needs those links of economic interest to make other people wish the same.

M. Marchetti

What other links do you suggest?

M. Höhne

Well, it is actually necessary to have people in this

group which possibly will use this process for their own purposes or to make business with it. That's important, otherwise the development will take too long before it goes into practice.

M. Marchetti

Yes, but you see, the criterium that is beginning to take shape is that to enter into this committee, one has to show that he is doing research or is spending his money or is thinking at this kind of problems. That is the ticket for entering, and paying that ticket satisfies your requirement that people coming here are interested in the utilization of the process because if they are not intersted they are not spending money or wasting man-hours for studying it. No? So your requirement is satisfied, in my opinion, if we put as a condition that the companies participating to the committee are doing some kind of research in this field by their own. Let me say are actually collaborating.

M. Höhne

That is quite right.

M. Valette

I just want to comment on this selction of committee. First of all before deciding on which committee it will be we must know what reaction you will be selecting. Because if you have a search for new processes after 1 or 2 years you will find out that the one you proposed this morning for the production of hydrogen is not necessarily what will be done. So this will be deciding: what you produce or intend to produce will be deciding

on what type of committee you have. And if you have several reactions that you study you will have different committees, and in our case in HTR, we have already started with working groups in collaboration with industry. And the selection is natural.

Of course, at the beginning you will find a lot of people coming, but if they have to pay for their own travel, if they have to spend time in discussing problems which are of no interst to them, they will soon disappear, and I think the criteria for selection should be first the people doing the work in this field and anybody who is able to contribute in this, at your own choice, you can decide, although this firm and this gentleman have nothing to do with this field but you like him to come, you can even invite him, you pay for his travel, but it is too early now to try to freeze the type of committee you have. You better see clearly, what you will be doing.

M. Marchetti

Let me say for the first question that we think to produce hydrogen, just to keep in our mind a very precise objective: ten years from now we don't know what is going to happen.

To the second that the committee has not been frozen a priori: the committee can evolve, and the committee itself at a certain moment can decide. So the requirement for elasticity is there to follow the evolution of the situation. You must keep in mind that the product is only one and that the research is essentially a laboratory research. We are not in the stage of designing a plant or even choosing one system or another. We are just exploring. For 5 years we must go on exploring the field. The answer is satisfying?

M. Teggers

Just a question. Will you write some headlines to the participants and write some questions at which one can answer. What will be the way in the future?

M. Marchetti

Yes, the first thing to do is to have, your opinion, better in a written form. I might send letters to all of you but you are here now and you may start the operation sending letters to us expressing your interst and intentions.

M. Teggers

You will write first ...

M. Marchetti

I think it is not necessary because you are all here and you are all intersted people for the moment being, perhaps I might write a few letters to other people which are not here, but in principle I expect that the firms represented here send a letter expressing their interest and the intentions about an Advising Committee for running this kind of research.

M. Teggers

Thank you very much.

M. Marchetti

I guess you agree, Mr. Weyand? We must find a sort of adjustment between different possibilities.

M. Weyand

In the case of industry I think it is the right way. I think the representatives of governments should be invited by Euratom.

M. Marchetti

Well, yes.

M. Höhne

Actually the members of the committee should be selected by you. Otherwise everyone goes ahead and writes you a letter whereby the composition of the committee may be adversely affected. For this reason you should address these letters to the people you wish to invite and not leave it up to these people to write to you.

M. Raievsky

A good procedure would be to make a compte-rendu of this meeting and asking for comments from the attendant of the meeting and collecting all these commentaries to contact, and this is on behalf of Euratom, to contact governments, that is essentially minister of research of the governments sending them, you see, the compte-rendu and asking for the constitution of such a committee. We can suggest names to the governments in this committee but this is only a suggestion, because they can have the idea for ...

M. Marchetti

In that case a government is automatically invited, certainly.

M. Teggers

That was my question. Is it not possible that you write some sort of invitation letter for this advisory group to all communities or to all firms and to all participants which are present. I would say that is a better solution instead of us writing to you if we

should be interested to attend this advisory group. It would be better if you start with the letter.

M. Marchetti

I think that we have to start somewhere. This is a practical, an empirical point. I would put then an evolutionary seed into the committee, in the sense, that the committee can evolve, even assorbing other people. But to start with, in a reasonable time I think the best thing is to have the people which are present now. This is up to a point an arbitrary selection but I hope it's a good selection to start with.

M. Teggers

Dr Van Heek, what do you think about this problem? The question of the first letter, should Ispra write a letter to our companies or ...

M. Marchetti

Participating in the working group.

M. Van Heek

We are a research institute too, and we are making our own hydrogen process using nuclear energy and coal, of course, but I think we are interested in all kinds of hydrogen making and we must see what other people do.

M. Marchetti

After all, having cheap hydrogen is perhaps a better way to sell coal than having cheap heat to put into your processes.

M. Van Heek

And if hydrogen is very cheap, cheaper than that from coal, we can make an hydrogasification of coal, why not?

M. Franzen

I don't think it will be reasonable even if price of hydrogen is below zero.

M. Teggers

You prefer to have a letter of interst from us.

M. Marchetti

Yes, because we must have a condensation nucleus, and I think this is the simplest way.

M. Steeman

But you first send a compte-rendu of the meeting?

M. Marchetti

Well, if the letter is sent to the participants the compte-rendu is not necessary first, we are going to send a compte-rendu certainly.

M. Steeman

I thought it would be very helpful if you send a summary of the discussions first, for it makes the problem clearer to the companies involved.
They should be able to define their position in this problem.

M. Marchetti

I don't think that your boss is going to read the compte-rendu before.

M. Steeman

Well, but nevertheless I think, that he should at least have a chance to read what it is all about. On the other hand writing down the discussion in your terms may be helpful in understanding it, as your impression may be quite different from mine.

M. Marchetti

That's another proposal.

M. Höhne

I think that's clear and your suggestion to form such a committee is accepted. What I wanted to say at the beginning was that we should find a way to give a chance also to those people who are not present, because it may be someone is more competent than we are. For the rest your suggestion was a good one and I feel that we can drop this point.

M. Marchetti

So perhaps we might close that meeting here.
Somebody has other questions?

M. Block

Perhaps you will be more precise on the subject of research. I think we have spoken only about the production of hydrogen. It would be better to consider all processes, such as the production of ammonia or methanol.

M. Marchetti

You see, hydrogen has a very large market and methanol a much smaller market. We should be simple as far as

possible to start with. In the future, as I said, the committee having in it the seed of evolution can evolve. They can decide. But if you start taking 10 different chemicals, we are lost completely. So, for the sake of simplicity, I would like to stick on hydrogen only.

M. Block

But there are only two or three cases where the market is big enough, e.g. ammonia or methanol, used instead of petrol.

M. Marchetti

This is part of the research, if at a certain moment the great solution is ammonia, I don't have any objection that this committee becomes a committee for the direct production of ammonia. I stick now to one thing just for simplicity.

Now, gentlemen, some of you have to leave and some would like to visit the laboratories. If you are intersted to visit the laboratories, e.g. the Physical Chemistry Laboratories, there is a small bus here at the entrance and we can make a visit of one or two hours. So you can have an idea of its size or of the equipment or of the problems we are tackling.

M. Höhne

Before we leave I feel we should thank the people of Ispra, in particular Dr. Marchetti, for the great trouble they have taken and for this really inspiring meeting.