

## Reflections on the report by Mr Armand, Mr Etzel and Mr Giordani entitled 'A target for Euratom'

**Caption:** In December 1957, in reaction to the publication of the report by the Three Wise Men focusing on the problems surrounding Euratom, the International Federation of Self-Generating Industrial Users of Electricity (FIPACE) reflects on present and future European policies.

**Source:** Fondation Jean Monnet pour l'Europe, [s.l.]. Archives Jean Monnet. Fonds AMK. 43/1/16. Fédération internationale des producteurs autoconsommateurs industriels d'électricité (FIPACE). Aspects européens de l'énergie, Quelques réflexions sur le rapport de Messieurs Armand, Etzel, et Giordani: "Un objectif pour Euratom". Bruxelles: 1957. 20 p. p. 5-8; 18-20.

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## Reflections on the report by Mr Armand, Mr Etzel and Mr Giordani entitled: ‘A target for Euratom’

### 1. Energy requirements for the Euratom countries

1. The report by the ‘Three Wise Men’ is based on an estimate of energy requirements for the Euratom countries up to 1975. It assumes (see page 55 of the report) that the requirements for these six countries will increase by around 3.5 % per year over the period 1955–1965 and by around 2.6 % between 1965 and 1975. Total requirements will therefore rise from 400 million tce in 1955 to 731 million tce in 1975, that is to say they will rise by 83 % in the space of 20 years.

2. This evaluation by the report’s authors is based on the increase in worldwide commercial energy production that occurred in the period between 1870 and 1955. On page 49 of the report, the following information highlights this trend:

Global production:

1870	218 million tce
1900	777 million tce
1913	1 399 million tce
1955	3 392 million tce

(tce = tonnes of coal equivalent)

The authors add (see page 50 of the report) that ‘between 1870 and 1955, global commercial energy production increased at an annual rate of around 4 %.’

However, a verification of their calculations shows that the precise value of the average annual rate of increase is actually 3.28 %; this discrepancy, over such a long period, leads to appreciably different results. Calculating on the basis of an increase of 4 % per year from 1870 would produce a total production for 1955 not of 3 392 million tce, but 6 113 million tce, i.e. production would have substantially exceeded real requirements.

3. The question arises whether it is justified to go back to 1870, or even to 1900, to evaluate future energy requirements, since industrial development in the countries in question was still in its infancy at that time and was subsequently to cause a sudden increase in these requirements at a much higher rate. Nor should it be forgotten that, at that time, sufficient quantities of cheap energy were available, the use of which did not in any way obey the economic principles currently applied.

If we seek to determine not the annual increase rate for the entire period from 1870 to 1955 but the rate for each of the time frames set out below, the result is as follows:

1870 to 1900	4.32 %
1900 to 1913	4.63 %
1913 to 1955	2.13 %

Accordingly, the annual rate of increase over the last forty years is much lower than for the period before 1913 and is lower than that quoted by the ‘Three Wise Men’.

4. The evaluations on page 55 of the report, a 3.5 % annual increase for 1955–1965 and 2.6 % for the period 1965–1975, indicate an average annual increase of just over 3 %. For the entire period at issue, the report’s authors present the likely trends in net imports as follows:

For Euratom:

a.	1955	1975
Expected consumption (million tce)	400	731
Internal production (million tce)	316	449
Net imports (million tce)	84	282
Net imports (%)	21.0	38.6

For Germany, one of the Euratom countries, these trends are as follows:

b.	1955	1975
Expected consumption (million tce)	181.7	318
Internal production (million tce)	186.3	246
Net imports (million tce)	-4.5	+72
Net imports (%)	-2.5	+22.6

The report's authors see in this inexorable increase in net imports a threat of increasing energy dependence for the Euratom countries, and their proposals, which seek to equip the countries in question with a network of nuclear power stations as soon as possible, are intended to ward off that threat.

5. As far as the probable increase in energy requirements over the next 20 years is concerned, it should be noted that no precise research has been conducted, except in a few specific sectors. Nor has there been any study of the considerable scope for primary energy savings. The increase rates quoted in the report are, therefore, based only on scenarios which are, in turn, based exclusively on data from previous trends. If we do not go back to 1870 but consider simply the period between 1913 and 1955, where the rate of increase in requirements is only 2.13 %, the picture is markedly different. It should also be borne in mind that, even during this latter period, there were times when there were surpluses of coal and oil offered at very low prices which were, in fact, much lower than their cost price; consumers have therefore not always been encouraged to use them sparingly. While, according to the 'Three Wise Men', the increase in energy requirements should rise to 83 % in 1975, application of the 2.13 % rate gives an increase of only 52.4 %. Moreover, it cannot be ruled out that an improvement in current operating methods will make it possible to reduce this increase in primary energy demand even further, while ensuring that requirements are fully covered.

In addition, the repercussions of reduced working hours on the trend in total production should not be ignored; this is one of the key factors in the increase in energy requirements. The report by the 'Three Wise Men' does not take sufficient account of this fact.

6. It might be helpful to show how developments and the trend in essential net imports would appear in the event of increase rates being a little lower than those envisaged in the report.

With an annual increase rate of 2 %, the Euratom countries' total energy requirements in 1975 would be slightly lower than 150 % of consumption in 1955. This figure corresponds roughly to the lower limit accepted by the OEEC for all its member countries (cf. '*L'Europe face à ses besoins croissants en énergie*', 1956). In that event, the figures given in the report by the 'Three Wise Men' relating to the likely trends in net imports (page 61 of the report) would have to be amended as follows:

c.	1955	1975
Expected consumption (million tce)	400	595

Internal production (million tce)	316	449
Net imports (million tce)	84	146
Net imports (%)	21.0	24.5

7. In this same scenario of an annual increase of 2 %, the figures cited in the report specifically for Germany, on page 68, would become:

d.	1955	1975
Expected consumption (million tce)	181.7	270
Internal production (million tce)	186.3	246
Net imports (million tce)	-4.5	+24
Net imports (%)	-2.5	+9

8. To give an idea of the scale of the discrepancy resulting from a relatively minimal variation in the rate of increase, let us see how energy consumption would develop if it increased by 1.5 % per year. In this instance, total consumption would go from 100 % to just under 135 % in the period 1955–1975. The resulting figures for all Euratom countries are as follows:

e.	1955	1975
Expected consumption (million tce)	100	540
Internal production (million tce)	316	149
Net imports (million tce)	84	91
Net imports (%)	21	17

For Germany, the figures are as follows:

f.	1955	1975
Expected consumption (million tce)	181.7	246
Internal production (million tce)	186.3	246
Net imports (million tce)	-4.5	+/-0
Net imports (%)	-2.5	+/-0

9. It can thus be seen how important it is, with regard to the future increase in energy requirements and to coverage of those requirements, to have relatively accurate information. Account should also be taken of possibilities for saving primary energy. The modernisation of pithead power stations, as a result of which available electrical energy resources are increased without any rise in coal consumption, is one example of such possibilities. The development of electrification works on the railways will also bring considerable coal and oil savings in future. In small and medium-sized industry too, energy consumption may be reduced substantially without any adverse effect on production.

10. If internal energy production is successfully increased and does not exceed the annual rate of increase for the period 1913–1955, or even if it remains slightly below that figure; as a result of more sparing use of available energy, the serious threat to the energy supply of the Euratom countries envisaged in the report by the ‘Three Wise Men’ will not happen. It will probably be easier and more economical to channel all resources and efforts into pursuing this objective rather than prematurely engaging in an ambitious plan to construct nuclear power

stations. Taking an objective view of the facts, as well as the resources available, it has to be accepted that the technical and economic conditions required to guarantee the success of such an undertaking have not yet been put in place.

[...]

### III. Cost of nuclear electricity

24. The authors of the report write on page 38:

‘... since the data that we possess on the operation of industrial-scale power reactors are based on very limited experience, the prices for nuclear energy that we give are always based on estimates and never on established facts ...’

This observation by the authors of the report is pertinent. The only nuclear energy production plant that could be called a ‘power station’ that has been in operation for a few months is Calder Hall, whose net capacity is 70 000 kW. A second plant, at Shippingport, with an electrical capacity of 60 000 kW, will be completed in late 1957 or early 1958. Experience of the ‘operation of industrial-scale power reactors’ (if we can actually talk, in general terms, about experience at present) therefore comes only from these two plants.

25. As regards Calder Hall, which is already on stream, there is no precise and comparable information about the cost price of the electricity that it produces. The figures published to date do not allow for a precise breakdown of the costs involved in the construction and operation of this power station or the costs of supplying it with nuclear fuel. This undoubtedly arises in part from the fact that Calder Hall is used primarily for plutonium production, with power for the national grid being generated only as a by-product. It goes without saying that the electricity prices entered in the accounts bear little relation to the real costs.

26. All the information and all the calculations relating to the probable cost price of nuclear electricity cited by the ‘Three Wise Men’ are based on hypotheses and estimates that continue to lack a secure foundation. Since nothing is certain, it is evidently impossible to prove that the hopes of the report’s authors will not come to fruition. It is perfectly possible that the downtime and operating costs of nuclear power stations will be reduced over time, in particular as larger units are brought on stream, and that it will be possible to resolve the technical problems, such as those raised by construction materials and corrosion, and all the other difficulties. What is important is to have sufficient time to avoid rash developments so that we may build viable and technically efficient nuclear power stations.

27. The addition of coal- or oil-fired superheating plants undoubtedly helps to reduce the costs pertaining to the actual nuclear part of the plant as long as this complementary electricity production based on conventional fuels is itself more economical. Moreover, it should not be forgotten that the power that can be attributed to superheating represents a significant fraction of total thermal power. For example, at the power station that is to be built at Indian Point in the United States, it will account for around 40 % of the total. It is self-evident that utilisation of this 40 % must reach a load level as high as that for the nuclear part of the installation; as a result, the conventional thermal energy requirements, which are intended to be stabilised, will exceed the figures cited in paragraph 20.

### Summary and conclusions

28. To understand the way in which the current situation will develop and the problems that will arise, it is important, first of all, to determine the increase in energy requirements that may be expected in the future. As we have seen, even slight changes in the annual rate of increase lead to very considerable discrepancies at the end of a relatively lengthy period. If the annual increase were 2 % rather than 3 %, any prospect of a ‘serious threat to Europe’s economic development and Europe’s security in the world’ would be ruled out.

29. In order to evaluate the future increase in the energy requirements of the Euratom countries, there is not, at present, any positive information that can be defended from a scientific or economic point of view, only partial information. It will be vital to conduct investigations so as to gain a clearer idea of the likely developments and the decisions that those developments will entail. Economic progress would also be jeopardised if, by overestimating requirements considerably, substantial production plants were set up that proved to be insufficiently economical, even if the extension and utilisation of energy produced in the Community countries were taken out of the equation.

30. The studies in question should also relate to technical and economic ways of saving energy. There are many examples to show that there are major possibilities that have not yet been exploited or have been exploited only insufficiently. These are well known, tried and tested technical methods, the use of which is not subject to any risk or uncertainty. At all events, such energy savings would be less costly and would prove to be more economical than the methods used to cover the same energy requirements by using nuclear plants.

31. As we have explained, it is impossible to operate nuclear power stations at the capacity envisaged by the authors of the report with a full load of 7 000 hours. Usage of nuclear energy capacity cannot, at present, exceed 3 430 hours per year; by 1975, it could reach 4 250 hours. The corresponding load diagram, determined not by the producer but by the consumer, shows a base load below 20 % of the peak load. If, by using reservoirs for example, an effort is made to spread out this load diagram — and it is not certain that this can be fully achieved — the cost price of nuclear electricity would have to be increased by the costs of this operation.

32. Faced with a load factor of 4 000 hours of use per year, only 40 % of the total output could be covered by the continuous base load, that is to say by nuclear energy, whilst the remaining 60 % would have to be covered by other sources of thermal energy. The share of production that can come from nuclear plants is, therefore, much lower than that quoted by the authors of the report. The aim pursued, to stabilise fuel requirements through the use of nuclear energy, cannot therefore be achieved by this means, even approximately. It could be done only if the use of nuclear power stations could be adapted to the specific load diagram, i.e. if these plants could be operated with a much lower load factor (less than 5 000 hours per year).

33. The calculations made by the ‘Three Wise Men’ do not appear to be accurate in the two cases envisaged, the case where nuclear power stations cover the base load and the case of utilisation at a lower load level. Either the aim, i.e. to stabilise fuel requirements and to limit foreign exchange costs, will not be achieved, or the viability of the nuclear power stations will be very different from what is expected.

For example, for an annual utilisation of 4 500 hours, based on price information provided by the ‘Three Wise Men’ (pages 76 and 78), the cost prices per kWh would be 50 % greater than those that they have calculated.

34. The above considerations must not be interpreted as an outright rejection of the introduction of nuclear power stations at some time in the future. Given the evolution of the energy economy and developments in energy requirements in the Euratom countries, complementary energy sources are urgently needed (whatever the rate of increase used). However, it is important to proceed with caution and to assess the opportunities and the consequences in full knowledge of the facts and from an objective point of view. Nothing justifies rash action which could result in unfortunate repercussions and lead to disappointments.