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East Europe Report

ECONOMIC AND INDUSTRIAL AFFAIRS

(FOUO 12/79)



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EAST EUROPE REPORT
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CONTENTS	PAGE
INTERNATIONAL AFFAIRS	
Prospects for East-West Cooperation on Energy Examined (Friedemann Mueller; EUROPA-ARCHIV, 10 Jun 79)	1
CZECHOSLOVAKIA	
Third Generation Fluidized Boiler Development (Vladimir Kanka; TECHNICKY TYDENNIK, 3 Jul 79)	12
POLAND	
Economy Seen Following West Into 'Crisis' (Frane Barbieri; LA STAMPA, 28 Jun 79)	17

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INTERNATIONAL AFFAIRS

PROSPECTS FOR EAST-WEST COOPERATION ON ENERGY EXAMINED

Bonn EUROPA-ARCHIV in German No 11, 10 Jun 79 pp 313-322

[Article by Dr Friedemann Mueller, Research Institute for International Politics and Security, Science and Politics Foundation, Ebenhausen near Munich: "All-European Cooperation in the Energy Sector: A New Starting Point for East-West Cooperation"]

[Text] Viewed as an integrated economic region, the Council for Economic Mutual Assistance (CEMA) exhibits a measure of harmony between production and demand in the energy sector -- thus of independence from the world's economy -- like that of no other important economic region in the world. Measured by consumption, energy imports are infinitesimal, and measured by production, exports of no energy source run higher than 12 percent. Thus it is not surprising that these countries initially remained almost untouched by the economic and structural effects of the 1973-1974 energy crisis. Nevertheless, the energy sector is showing structural problems that could make this a key sector for the overall economic growth of CEMA and for its international economic relations.

Energy Production and Consumption in the CEMA Sector

Between 1970 and 1976, the Soviet Union was able to increase its energy production by an average of 5.5 percent each year, while domestic consumption grew by 4.7 percent. This made possible an increase from 11.9 percent to 13.9 percent in the net export share of production. Above-average annual production rates were achieved during this period for crude oil (6.7 percent) and natural gas (8.5 percent), while there was relatively little growth in the production of coal (2.4 percent) and electricity from water power and nuclear power (1.2 percent).¹ The Soviet Union's most important energy source since the 1960's has been crude oil. In the mid-1970's, oil's share of energy production amounted to 43 percent, and since 1974 the Soviet Union has been the largest producer of crude oil in the world. Thanks to above-average growth in oil production, increasing amounts have been left over for export after domestic demand has been met, a situation that has led both to the coverage of demand from CEMA partners as well as to an increasingly more profitable acquisition of foreign exchange.

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Developments in the area of natural gas have been more turbulent than with crude oil in recent years. In contrast to the oil situation, the gap between gross and net natural gas exports is very large (close to fourfold); in other words, the Soviet Union has an extensive export potential by virtue of its substantial imports of natural gas. On the one hand, these imports -- 80 percent from Iran and 20 percent from Afghanistan in 1976 -- offer the advantage of shorter transport routes and favorable economic relations; on the other, they make it possible to assure supply within CEMA and to build up markets in Western Europe at the same time.

The structure of energy source distribution is quite different in the East European countries than in the Soviet Union, from the standpoint of both production as well as consumption. Abundant supplies of coal in these countries are balanced by only negligible opportunities for the production of natural gas and crude oil. Only Romania is different: Only 16 percent of its energy production is derived from coal, while 27 percent comes from oil and 56 percent from gas; its net imports of energy amount to only 7 percent of production.² In 1970 the East European countries were still able to cover about 30 percent of their oil consumption from their own production; in 1976 this figure was only 19 percent. Since domestic production has been stagnant since the beginning of the 1970's, import requirements that have been increasing at an annual rate of 12 percent have been rising disproportionately compared to annual increases in consumption (9.3 percent). The situation is quite similar in the natural gas sector. Since production increases were unable to keep pace with increased consumption, the result was a vigorous expansion of import demand, which tripled between 1970 and 1976. In terms of quantity, coal is the most important energy source as regards production and consumption. Production not only assures self-sufficiency; it even surpasses consumption by 6 percent.

Trade between the Soviet Union and the East European countries demonstrates the disparity in the degrees of self-sufficiency of these two parts of CEMA. In the case of crude oil, imports from the Soviet Union supply two-thirds of the needs of the East European countries and constitute more than 80 percent of the oil imports of these countries. As far as natural gas is concerned, the degree of self-sufficiency of the East European countries is still quite high but is on the decline. Imports are brought in exclusively from the Soviet Union. Since the Soviet Union supplies the natural gas imports, and the degree of self-sufficiency is declining at the same time, the result is an increase in natural gas imports from the Soviet Union at a present annual growth rate in excess of 20 percent. In 1976 the East Europeans spent 2.54 billion transfer rubles for oil imports and 0.42 billion for gas imports. Oil payments by the East Europeans rose in 1977 by an additional 31 percent over the preceding year to 3.3 billion transfer rubles; gas payments rose by 30 percent to 0.54 billion transfer rubles.

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Potential Development

The potential for further development of the energy sector in the CEMA region can be deduced from an ECE [Economic Commission for Europe] study that appeared in 1978³ and which contains a comprehensive treatment of energy production in the 1980's in Europe. According to this study, CEMA will be producing almost exactly as much energy as it consumes by 1990. Measured by overall production, the calculated deficit of 16 billion tons of hard coal units (SKE) constitutes less than 0.5 percent. By comparison, the CEMA surplus amounted to 5.4 percent in 1975. CEMA continues to be a net exporter of coal to a small degree (25 million tons of hard coal units), while net exports of natural gas are rising to 38 billion cubic meters. Oil, on the other hand, is experiencing a reversal. A surplus amounting to 53 million tons (in 1975) is turning into a deficit of 50 million tons.

The central problem now concerns the position of the Soviet Union with regard to the disposition of its export potential for crude oil and natural gas. If it continues its present practice of dividing its oil exports about equally between its CEMA partners and the Western countries, the East European countries will still have a deficit of close to 170 million tons.⁴ According to current oil prices, it would cost U.S. \$15.5 billion to procure this amount on the world market. This would be about 1.2 times the total export volume of these countries (in 1977) with the Western nations. On the other hand, going by today's prices the Soviet Union would in this case take in U.S. \$11 billion from its oil exports to the West.

It is unlikely that the East European countries could withstand such a foreign exchange burden without coming up against the debt limits that would be tolerated by the West. The Soviet Union will therefore probably find itself constrained to make a larger share of its export potential available to the East European countries. But the result would be that its foreign exchange proceeds from oil (U.S. \$6.35 billion in 1977) would no longer increase at all, or only slightly. Were the Soviet Union to freeze its foreign exchange receipts at their present level -- on the assumption that oil prices remained stable -- and channel any further deliveries to CEMA, the East European countries would still have to come up with about U.S. \$10 billion for their additional oil imports from the West. Oil price increases would bring greater losses of foreign exchange for the East Europeans than gains for the Soviet Union. Conversely, oil price reductions would bring relief to the East European countries and CEMA as a whole but would cause the Soviet Union to lose proceeds.

The Soviet Union has more latitude when it comes to natural gas. Even with complete satisfaction of Eastern Europe's import requirements, it could still offer (net) exports of 38 billion cubic meters, a volume that represents triple the amount of exports of natural gas to the West compared to 1976. Imports from Iran and Afghanistan can release additional amounts for export. The expected net foreign exchange proceeds would amount to about 2 to 3 billion U.S. dollars according to current prices.

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The ECE study indicates that regardless of how the Soviet Union apportioned its energy exports, by the end of the 1980's it will be taking in lesser amounts of foreign exchange from energy exports than its CEMA partners will have to be paying out, while today it is still covering the import requirements of these countries almost completely, and, at the same time, more than 50 percent of its exports to the West are energy exports. Consequently, a thoroughgoing restructuring of CEMA foreign trade will be imperative in the 1980's.

To be sure, the possibilities of effecting such a restructuring through the Soviet Union's own investment efforts are limited. Of the total investment funds available to the industrial sector in the Soviet Union in the first half of the 1970's, a 28.6-percent share⁵ went for energy investments. These funds were distributed as follows: 35 percent for the production of electric power -- chiefly nuclear power installations; 33 percent for oil production; 17 percent for natural gas production.⁶ The increase in total energy production for the same period (1971 to 1975) amounted to 73 percent for oil, 22 percent for gas, 5 percent for coal and 0.3 percent for electric power. At least two facts can be deduced from this comparison: first, that enormous investments are tied up in the electric power sector, a situation that will not ease the burden on the overall energy balance to any meaningful degree in the short and medium terms; second, that the ratio of investment to production is much more unfavorable in the case of coal than it is for oil and gas.

The current 10th Five-Year Plan calls for an annual increase of 3.8 percent for industrial investments. Applied to the energy sector, this rate of increase is very low. Indeed, a shift in investment distribution in favor of the energy sector is certainly conceivable⁷ -- if the total increases in industrial investments were to be channeled to the energy sector, a growth of 12 percent could be attained -- but the data from the past 2 years do not indicate that the Soviet Union actually has this latitude in the area of investment apportionment.

On the other hand, investment costs per unit of energy produced have been rising. For instance, each year between 1971 and 1975 these costs for oil averaged 5 percent more per unit of energy than for the preceding five-year plan; they averaged 10 percent more for gas.⁸ One reason for this is that drilling costs were 17 percent higher in 1975 than in 1970 because of greater depths and more unfavorable geological conditions.⁹ Another reason is that investment costs per unit of energy rise as the distance from the place of consumption increases. In view of the fact that energy production is being shifted to Siberia to an ever greater degree -- there has been an absolute decrease in the production of crude oil in the European part of the Soviet Union since 1974 -- and considering the geological and climatic conditions that are becoming more difficult, substantial increases in production costs per unit of energy produced must be expected in the future as well, so investment growth will largely be eaten up by cost increases.

4

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The rapidly increasing import of equipment for crude oil and natural gas production between 1974 and 1976 can be considered an indicator of the limited opportunities for providing the necessary technology from the Soviet Union's own resources.

Options of Soviet Union and CEMA

The figures cited above are based on the relatively optimistic ECE projection. Nevertheless, in the area of foreign exchange and investments in particular, they reveal obvious problems that make unstable development appear to be a possibility. If the Soviet Union and the other CEMA countries do not succeed in changing their export structure in such a way that a substantial share of energy exports is replaced by other exports (in the case of the Soviet Union), or unless energy imports are financed by additional exports (in the case of the East European countries), then a process could be started that could increasingly restrict the planning latitude of these countries.

An expected economic growth of less than 4 percent means minimal freedom of action in the apportionment of investment funds but also in efforts to restructure overall production with the aim of obtaining greater opportunities for export. If investment costs per unit of energy produced increase so sharply that the extra investments cannot achieve the expected increase in production, this once again reduces overall economic growth and export opportunities, thus further limiting investment funds.

The Soviet Union could break out of this spiral under the following conditions: (1) Investment costs per unit of energy must not increase substantially; (2) even with minimal economic growth, a shift within the national product would have to set aside investment funds for energy production sufficient to permit a stabilization of economic growth at a low level; (3) additional energy sources would have to be developed without additional outlays of foreign exchange or increasing investment outlays; (4) economies in the consumption of energy would have to be achieved through its more effective use in the production process; (5) East European and Western industrial nations would have to provide a portion of the investment funds; (6) growing trade deficits with the Western industrial countries would increasingly have to be covered by credits from these countries.

A stagnation or only minimal rise in the cost trend for investments (point 1) can be ruled out in view of the known data on transport routes and exploitation conditions. To be sure, investment costs per unit of energy could be reduced by reducing the proportion of investment-intensive installations -- mainly power plants, but this could result in relief from present problems at the expense of the future.

The allocation of a sufficient volume of investment funds (point 2) is opposed by other sectors with growing investment requirements, particularly the transport sector and the arms sector. A shift of this sort would have to be made at the expense of the consumer sector and possibly other

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growth-inducing sectors of production as well. The Soviet Union would thus be forced to cut itself off from the Western industrial nations,¹⁰ a situation that would run counter to interdependence in foreign trade as well as to a stabilization of the detente process. Additional energy sources could be developed without added foreign exchange and investment outlays if CEMA were to forge economic ties with countries of the Near East. Of course, there is little reason to believe that petroleum-producing countries would in their own interests give up their foreign exchange proceeds in favor of economic interdependence with CEMA (point 3).

Opposing any essential energy saving through effective use in the production process (point 4) are experience and prognoses. An initial starting point for East-West cooperation might be found in the area of energy conservation technologies.

The procurement of investment funds (point 5) from CEMA would be obstructed by the limited capacities of these countries. The Western industrial countries would be able to provide more potential if they could be convinced of the desirability of extensive involvement.

And finally, an even more far-reaching willingness on the part of the Western industrial nations to advance credits would increase the Soviet Union's freedom of action (point 6). A necessary condition of such a willingness, however, would be a comprehensive safeguarding of Western interests.

Starting Points for East-West Cooperation

As regards a stabilization of the policy of detente, it cannot be in the best interests of the West (1) if the Soviet Union and the East European countries cut themselves off from the West to a greater degree because of economic problems; (2) if the East European countries become even more dependent upon the Soviet Union; (3) if the Soviet Union should seek to extend its sphere of influence in the Near East as the result of an undesirable economic situation.

In keeping with the idea of preventing the Soviet Union from pursuing these goals, it would be in order to determine to what extent a common realization of interests in the energy sector is conceivable for Eastern and Western Europe, particularly since the West has to be interested in an expansion of the world's energy supply, even from the Soviet quarter.¹¹

The Soviet Union has for a long time been seeking to convince Western Europe of the desirability of cooperation in the energy sector. At the 24th CPSU Party Congress in 1971, Premier Alexei Kosygin suggested in connection with the proposed European security conference -- the subsequent CSCE -- the establishment of a joint energy system for Europe that could lead to fundamental changes in the solution of energy balance problems.¹² Four years later, the energy sector was assigned special importance within the scope of Basket II at the Conference on Security and Cooperation in Europe. In the section on

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"projects of mutual interest," the participating states expressed the view "that the areas involving energy sources, particularly crude oil, natural gas and coal...are suitable areas in which to step up long-range economic cooperation and develop trade, insofar as this trade should come about."¹³ Following the CSCE, party chief Leonid Brezhnev proposed in December 1975 that all-European conferences be held on the environment, transportation and especially energy. This proposal has been repeated many times since then and was also brought up again at the 1977-1978 CSCE follow-up session in Belgrade and at the ECE level.

One reason why the Soviet Union is seeking a comprehensive conference on this subject is that it cannot continue to count on big increases in petroleum and natural gas exports to the West without a reorientation of its energy policy. Another reason is that it would like to bind the West to an integrated program that would (1) provide for cooperation in the research and development of new energy sources, in the transport of energy resources and in the introduction of energy conservation technologies; (2) cover the question of financing and crediting as well as making compensatory payments on investments, using primary and secondary energy sources and those that have been processed into raw materials; (3) clarify the extent to which the Western countries are prepared to transfer investment funds and technology on a long-term basis, and to what extent security policy considerations impose limits on this type of cooperation. Only an integrated program such as this could enable the Soviet Union to engage in long-range planning. In particular, the Soviet Union is seeking assurances that export restrictions on strategic goods and the granting of credits will not be made to hinge upon day-to-day policy decisions but that limitations will be fixed in clear terms on a long-range basis.

An all-European accord would have to be conceived on the basis of the fact that the resources of Eastern and Western Europe complement one another. Balanced against a large supply of energy reserves (and, under certain circumstances, sizable reserves in the matter of burdens on the environment) and a scarcity of investment funds and technology in Eastern Europe (Soviet Union) are a large supply of investment funds and technology in Western Europe and a scarcity of energy reserves and few reserves in the area of environmental concerns. Agreement on long-term energy deliveries -- such as the one that already exists in the natural gas sector for the period up to and beyond the year 2000 -- would therefore also have to conform to long-term arrangements in the areas of financing and the transfer of capital and technology.

The East European countries would be the most amenable to ties based on an all-European electricity system. This could consist in a cooperative effort in the construction of power plants as well as of high-voltage lines running across state borders. Moreover, Poland is also interested in cooperation designed to convert coal into liquid and gas energy sources as well as electric power; it also has an interest in collaborating with the Soviet

7

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Union, the GDR and the FRG on the construction of an East-West natural gas pipeline.¹⁴

A central issue is the question of how far the Western countries are prepared to go in the matter of granting credits. It makes little sense to designate economically determined limits of borrowing power, especially in the case of state trade countries. On the one hand, these countries carefully observe their payment obligations, and, measured by their economic potential, their credit volume is not large; on the other hand, their annual foreign exchange proceeds figure compared to overall indebtedness is larger than that of most developing countries.¹⁵ The limit of willingness to grant credits is not least of all a matter of international liquidity. In view of the major economic and political significance of a comprehensive cooperative effort in the energy sector, the question arises of whether -- from the credit standpoint as well -- an all-European project such as this should not carry more weight than similar projects with other countries. Economic doubts like those that are being expressed in opposition to an expansion of CEMA's borrowing power would have to be many times greater in the case of China especially.

The Question of Economic Dependencies

The reason why the West European countries have thus far reacted with so little interest to the Soviet offer of all-European cooperation in the energy sector is that this cooperation could lead to unilateral dependencies at the expense of West European freedom of action, particularly in crisis situations.

A comprehensive cooperative effort between Eastern and Western Europe in the energy sector would (1) make Western Europe dependent upon energy imports; (2) create through the regular export of capital goods a dependence on exports that would affect job security in particular; (3) result in an increasing dependence on the repayment of credits caused by the necessary crediting of exports. Conversely, the CEMA countries would be dependent upon a regular supply of long-term exploitation and transport investments and Western willingness to grant long-term credits.

Assurance of West European raw materials supply alone would be important from the aspect of pressure being applied in the short term. All other forms of dependence might indeed have an influence on economic and structural development but would not adversely affect the security of one of the blocs in the event of a crisis. The extent to which dependence on the import of raw materials can be a starting point from which to apply pressure depends primarily upon the percentage of imports from CEMA out of Western Europe's total consumption, or consumption by the respective West European country. The FRG imported 4.7 percent of its oil consumption and 8.2 percent of its gas consumption from the Soviet Union in 1976 (EC imports amounted to 3.9 percent and 4.3 percent, respectively). Critical limits for import dependency are normally considered to be between 13 and 15 percent for oil and between 15 and 20 percent for natural gas. The greater the assurance of substitution

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for these products through other markets, and the greater the short-range economies in the products, the further these limits can be stretched because they are not of vital importance.

As a result of the "Agreement on an International Energy Program" among the member states of the International Energy Agency (IEA), economy measures go into effect in all member states as soon as one country loses at least 7 percent of its oil supply for a lengthy period. If deliveries drop off by 12 percent, redistributions are made among the member nations. This means that countries which are less dependent upon Soviet oil would make partial substitutions. The possibilities for economizing in the sectors that are able to react flexibly to pressure applied for reasons of security policy are assuming substantial proportions. If necessary, a considerable share could be saved in the private transport sector alone, which accounts for 20 percent of the oil consumption. In addition, if the stockpile established for this eventuality were to be drawn down for 900 days, for example, this would provide a 10-percent share of total oil consumption. Furthermore, if a coalition between the Soviet Union and OPEC is ruled out, an increased dependency upon Soviet energy deliveries would then mean a decreased dependency upon the members of OPEC. But even considering the possibility of a coalition, dependence upon the Soviet Union plus OPEC would be no greater than present reliance on OPEC alone if the additional demands made on the Soviet Union were to be lifted from OPEC.

No one can determine a precise level at which the percentage of imports out of total consumption becomes relevant in terms of security policy. But even assuming an unfavorable state of affairs, if the Soviet Union were to be able to control 20 percent of the crude oil and natural gas consumption¹⁶ of the West European countries, it could at most exacerbate an existing crisis situation, but not control it in terms of security policy. The dependency aspect is losing its significance, however, since it is not anticipated that the Soviet Union would be able to cover 20 percent of Western Europe's oil and gas requirements even with an intensive investment contribution on the part of the West. With this instrument, which would be tantamount to a break in economic relations, the Soviet Union would only be able to do economic damage to the West; it could not decisively weaken its defense capability.

A comprehensive cooperative effort in the energy sector involving CEMA and the Western nations would be meaningful only if organized on a long-term basis. This is because profitability can be achieved from infrastructure measures and production investments only over a time frame of much more than two decades. A cancellation of this cooperation would be difficult for the Western side to absorb, since export obligations would go unmet and portions of future energy supply would be jeopardized. Nevertheless, it can be assumed that the disruption of long-range planning in the Soviet Union and the East European countries brought about by this break would create supply problems and an investment deficit that would have graver consequences than the economic disadvantages in the business sector for the Western countries.

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In the monetary sector, the Eastern side will be depending for decades to come on having expiring credits renewed repeatedly and, temporarily, on having the credit volume expanded as well. A single instance of nonpayment would jeopardize the entire credit system, particularly the granting of future credits. A breakdown of credit relations would in reality be virtually equivalent to a breakdown in the transfer of capital and technology. A refusal to repay credits that were expiring would scarcely cause the collapse of banks and businesses in Western countries, at least not in the FRG. The state could absorb the loss of these predominantly guaranteed credit repayments by borrowing from the Federal Bank, by way of the capital market or through the budget, with no expectations of serious harm to the economy as a whole.¹⁷

Consequently, it is inconceivable that one of the two sides would jeopardize for the sake of a questionable short-term advantage a cooperative effort in the energy sector that would be meaningful only from its long-term aspects. It can rather be assumed that the long-range projection of such a cooperative effort would produce structures that could create the kind of ties envisaged in the CSCE Final Act, enduring ties which would extend beyond the planned projects themselves.

FOOTNOTES

1. Calculated according to "World Energy Supplies, 1971-1975," New York, 1977.
2. Cf "World Energy Supplies, 1972-1976," New York, 1978.
3. Economic Commission for Europe, "New Issues Affecting the Energy Economy of the ECE Region in the Medium and Long Term," preliminary version, Geneva, 1978. A quantitative analysis of this study as well as of the Soviet energy sector since 1970 can be found in Friedemann Mueller's "The Situation in the Energy Sector in the Soviet Union with a View to the 1980's," OSTEUROPA WIRTSCHAFT, No 1, 1979.
4. Subtracting the allotment to Cuba (about 8 million tons at present) from the CEMA supply, the deficit increases to 180 million tons.
5. Cf ECE, "New Issues...", loc cit, Supplement 1, p 71.
6. Ibid.
7. For instance, in a study on future crude oil production in the Soviet Union, the German Institute for Economic Research assumes that a shift of this kind has to take place and that the Soviet Union also recognizes the urgency of this move. Cf Joachim Bethenhagen, "USSR Facing Oil Deficit?", DIW WOCHENBERICHT, No 50, 15 December 1977, p 428.

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8. Cf A.K. Fischer, "The Mineral Oil Economy in the Soviet Union," ANEP/Annual of the European Petroleum Industry, 1977, p 51.
9. Cf CIA, "Prospects for Soviet Oil Production -- A Supplemental Analysis," ER 77 - 10425, Washington, 1977, p 22.
10. This argument is also supported by Robert Campbell. Cf "Implications for the Soviet Economy of Soviet Energy Prospects," THE ASSOCIATION FOR COMPARATIVE ECONOMIC STUDIES BULLETIN, Vol 20, No 1 (Spring 1978), p 46.
11. Cf, for example, The Trilateral Commission, "Energy Managing the Transition," Washington, 1978, p 91.
12. Cf PRAVDA, 7 April 1971.
13. Cf text of CSCE Final Act, EUROPA-ARCHIV, No 17, 1975, pp D 437-484.
14. Cf speech by Kazimierz Kopecki at the German-Polish talks in Allenstein in October 1978.
15. On this question, see Friedemann Mueller, "CEMA Indebtedness in Relation to the West -- A Study of Its Critical Limits from Economic and Political Standpoints," Ebenhausen, October 1977 (Science and Politics Foundation -- AZ 2148).
16. In the case of natural gas, dependence in Western Europe is less sensitive than for oil in terms of imports because of the high level of supply from its own reserves.
17. At the present time, the FRG's annual volume of new debt amounts to between DM 30 and 40 billion without causing a substantial rate of inflation.

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CZECHOSLOVAKIA

THIRD GENERATION FLUIDIZED BOILER DEVELOPMENT

Prague TECHNICKY TYDENNIK in Czech 3 Jul 79 p 4

[Article by Vladimir Kanka, PhD: "The Fluidized Boiler: Still at the Experimental Stage"]

[Text] Saving energy and economizing on the use of fuels are daily problems at every place of work; they are also the topic of research efforts. In Prague we have an inventor who back in 1970 was awarded a patent for his invention of a third-generation fluidized combustion boiler that, if put into production, could have lengthened the "life" of the North Bohemian soft-coal district by 15 to 20 years, according to mining specialists.

Where has this boiler been installed? Is it already being manufactured?
No!

Advantages of the Third Generation Boiler

The combustion process and the disadvantages of first- and second-generation boilers are well known: sulfur-removal is impossible in the first-generation boilers, and for the second-generation boiler, Duklafluid, only 20 percent can be removed. A feature the two boilers share is their large size--another disadvantage. Duklafluid is built to burn fuels having a high ash-content.

The third-generation fluidized boiler makes use of the more advantageous characteristics of the fluidized technique. Sulfur removal and combustion take place in a single fluidized layer from which the heat is extracted very intensively, and thus the size of the boiler is substantially reduced. Such boilers are being developed by the Soviet Union, Japan, Australia, and India, among others.

Engineer Jaroslav Beranek of the Prague Institute of the Theoretical Bases of Chemical Engineering of the Czechoslovak Academy of Sciences (UTZCHT) came up with an entirely new and original solution to the concept of the third-generation fluidized boiler about 10 years ago. The boiler desulfurizes at all levels of output, independently of the amount of steam produced. The optimal temperatures of the fluidized level for desulfurization can be independent of the kind of fuel being burned. Burning takes place at temperatures between 750 to 900 degrees Celcius.

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The advantages of Engineer Beranek's invention are just what the present energy situation requires. The other, foreign, third-generation fluidized boilers do not have these properties. In them, the temperature of the fluidized layer changes with a change in the amount of steam, and the consumption of limestone necessarily increases, by as much as a factor of two.

According to extensive tests on the boiler made at UTZCHT, it removes 90 percent of the sulfur present, has a caloric efficiency 10 to 15 percent higher than present boilers, and its flue gases contain a minimum of nitric oxide, 0.003 percent. For a pulverized coal boiler the percent of nitric oxide is 0.16 percent.

Since combustion occurs at relatively low temperatures, heavy metals do not get as far as the flue gases, but remain in the ash. The ash is removed from the hearth in greater quantities than in other boilers, and only about 15 percent of it flies into the electric filters before the stack. With the advantages of the boilers described, the stacks could be lower.

Another advantage is that the surfaces of the boilers do not scale up and do not corrode. Since the temperature is uniform throughout the fluidized layer, no soot whatsoever is formed. Also, there is a uniform load on the tube material and thus it is possible to superheat the steam 20 to 30 degrees Celcius closer to the allowed maximum temperature, increasing the efficiency of the transformation of the energy contained in the fuel into electric energy.

Using Waste Materials

The major advantage of Engineer Beranek's boiler, however, is that it burns refuse materials that cannot be otherwise used and that as trash add to the problems of enterprises and, in large quantities, interfere with the eco-system. This is about all refuse from the food industry and from tanneries, and in the fluidized boiler being installed in Kladno they are beginning to burn lubrication oil, refuse tar, and Kladno [coal mining] offal.

It is not just a matter of burning refuse, then, but of turning it into thermal energy. Operating the boiler does not require more manpower than previously used boiler types.

There are so far only two of the third-generation fluidized boilers designed by Engineer Beranek in existence. The first, the previously mentioned test unit with an output of 0.1 megawatts, is at UTZCHT, and the second is under construction at the United Steel Works, National Enterprise, in Kladno (SONP). It will have an output of three megawatts.

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Unnecessary Delays

Why only two boilers? The inventor did not stop working, he did not give up, when the realization of his design was postponed. He became accustomed to the lack of interest he encountered when he wanted to undertake laboratory experiments, to construct an experimental model, and then the boiler in Poldi-SONP. There was not enough interest in embodying the progress made in research in industry, it looked as though it would all end up as just a research publication.

No change was brought about by the request of the North Bohemian electric plant for the construction of third generation fluidized boilers. From 1973 on practical tests of the invention's principle were put off, even though the positive results of the fluidized combustion technique and its advantages had been known since 1972. At that time the first proposal was made to include the task in the state plan of the development of science and technology.

And thus the Vitkovice ironworks and the Klement Gottwald machine works as coordinator eliminated from their production plan the first third generation boilers, even though many people there literally rooted for the idea. It was the same even at the CKD (Ceskomoravska-Kolben-Kanek Heavy Machinery Plants) in 1975.

The situation was changed by the decision made by the federal government in 1977, which accelerated the construction of the pilot operation.

Shortly thereafter, the construction of the pilot third-generation fluidized boiler was enthusiastically undertaken by the Poldi SONP power supply. At the heating plant even in engineering development there are many supporters of "Beranek's boiler," and nobody has pointed out that the boilers are not a part of Poldi's production program. In order that the boiler go into operation as soon as possible, a complex rationalizing brigade was formed at the Poldi SONP under the leadership of Eng Zdenek Kodytek.

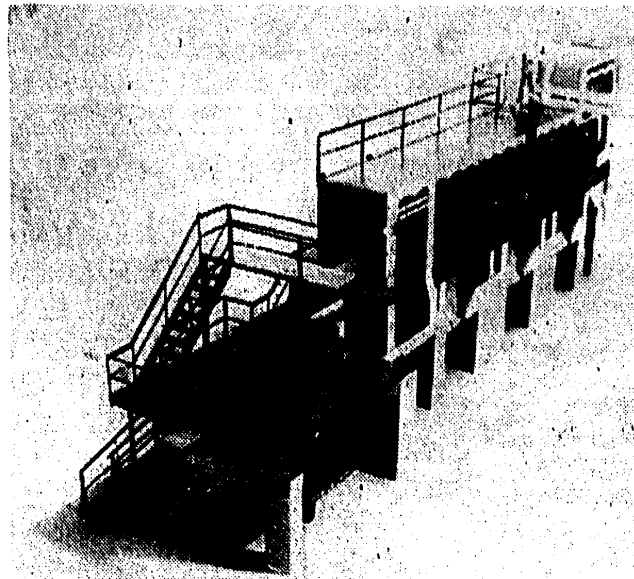
No Larger Boilers Until 1983?

The construction of a 20-megawatt boiler based on Beranek's design is planned for the electric power plant in Trmice for 1983 as an element of the state plan for the development of science and technology, and another 50 megawatt boiler in Tatra in Koprivnice is also in the technological development plan after 1983. Series production of these boilers is to be insured by CKD Dukla and will not begin until 1983.

A great deal of time has been wasted in putting the invention of third-generation fluidized boilers to use. Why?

14
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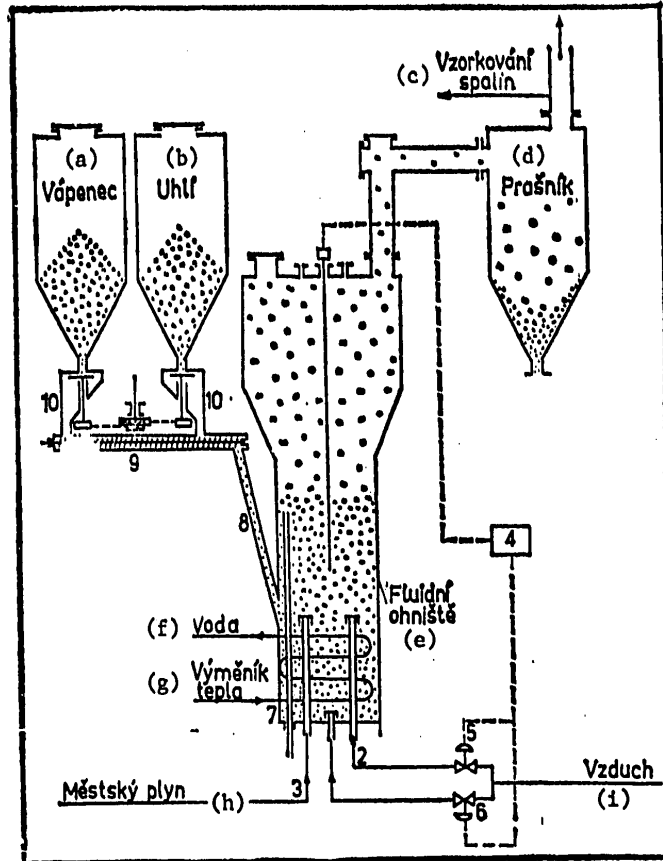
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Model of boiler with a fluidized fuel bed. After it was installed on a double-burner boiler from the heat station Poldi-SONP steam production tripled.

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Schematic Diagram of the Fluidized Fuel Bed

- | | | |
|---------|---------------------------------|------------------------|
| Key: | | |
| 1 and 2 | air intake | (a) line |
| 3 | intake of municipal gas | (b) coal |
| 4 | automatic temperature regulator | (c) flue-gas sampling |
| 5 and 6 | pneumatic reduction vents | (d) fly-ash separator |
| 7 | overflow | (e) fluidized fuel bed |
| 8 | inclined tube | (f) water |
| 9 | screw feeder | (g) heat exchange |
| 10 | underfeed stokers | (h) municipal gas |
| | | (i) air |

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POLAND

ECONOMY SEEN FOLLOWING WEST INTO 'CRISIS'

Turin LA STAMPA in Italian 28 Jun 79 p 3 LD

[Dispatch by Frane Barbieri: "Poland in Crisis Looks West"]

[Text] Warsaw--At the time when the Pope's pilgrimage was transforming all Poles into pilgrims in their own land, a well known intellectual of the regime told me: "Unfortunately, even if he came to visit us every day, Wojtyla could not help solve the country's vital problems: He will leave for Rome and the Poles will remain where they were and where they are forced to remain."

Though marked by a degree of resentment, the verdict expresses fairly realistically the fact that the Pope's visit did not facilitate the solution of any of the chronic difficulties with which the Warsaw government is struggling. If anything, it has added a few more. Wojtyla emphasized that the Poles are spiritually and culturally still Western but that, at the same time, as a socioeconomic body they are rigidly trapped in the Eastern-bloc system.

This often traumatic separation is proving difficult to overcome on the political plane. On the economic plane it is producing a contradiction, which is in many respects paralyzing: "The Poles would like to live in a Western manner and work in an Eastern manner." This remark, made to me by an economist, (in rough terms it indicates the tendency to consume a great deal and to produce little) becomes an almost perfect synthetic formula for the present Polish economic crisis and its causes.

I would point out at once that not everyone is agreed on the term "crisis." It is used unhesitatingly by the ordinary citizens who in the mornings take their hard-won places in the lines in front of the food stores or by those who, having received a pay rise, can find no way to spend their money since here, where prices are fixed, inflation works in reverse: since goods cannot cost more, they are not to be found.

The term "crisis" is not accepted, however, by officials. According to them, the phenomena are due to adjustments within a "dynamic and animated development." The crisis exists only in the West and, if anything, it is

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the occasional repercussions of that which are felt here. And to prove this they produce more and more data to show that, on the basis of growth rate and industrial expansion, Poland holds a high position in the world's league tables.

This place on the ladder is belied by the appearance of the big Warsaw department stores. Every time I return here I follow the same route. I find few changes from when I was here 3 years ago, at the time of the Ursus and Radom workers revolts. The exquisite taste shown in filling the shelves with reminders of the West does not hide the scarcity and uniformity of the clearly Eastern-bloc goods. Indeed, in an attempt to draw a comparison--which is always suggested to a traveller to these countries--again I find the Warsaw stores inferior to those in Budapest (supplied) with incredible commercial expertise by the Hungarian technocrats), and Prague (filled with precautionary Soviet supplies) and Berlin (boosted in competition and rivalry with the West). Bucharest and Sofia are still behind, fairly poor and gray, while Warsaw's lead over Moscow is shrinking: in other words, it offers more or less the same goods.

So: Crisis or rearrangement? In order to clarify this better I turned to three authoritative interlocutors: Professor Bozyk, officially chief of first secretary Gierek's scientific advisers; Professor Fedorowicz, deputy chairman of the Council of Ministers Planning Commission, and POLITYKA editor and influential Central Committee member Doctor Rakowski. The former received me at the marble party headquarters, the second at the planning "temple" and the third at his new editorial offices. Never before has it been so easy to meet with Polish representatives, and never before have then seemed to me so willing to converse and even to make revelations.

When such important figures go so far as to acknowledge that their deficit with the West has risen to \$15 billion and that they will have to increase it to be able to start paying it back (the debt with the USSR is never mentioned and is probably incalculable within that paradoxical complex of economies paid for by policies and vice versa); and when, moreover, they add that again this year they will have to import \$1.5 billion' worth of grain from the United States, that 40 percent of the state budget within the framework of ultracentralized accumulation is being spent on subsidies to maintain unbalanced prices and unprofitable forms of production, then they do not even need to use the word "crisis," which is so readily used in the West, to convince you that they are seriously discussing a more than difficult economic situation.

First, I eliminated from all the conversations the issue of relations with the Western countries, partly because that seemed to me to be one of their major concerns. There is obviously regret over the growing barriers on the European markets, which have caused the collapse of Polish exports, and there are complaints about the increased price of Western technology which is forcing Poland, which cannot do without it, to import inflation as well. They view as almost a golden age the time when detente [words indistinct] economic expansion was bringing into Polish industry a flow of credits payable with products from the new industries.

18

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Furthermore, the impact of the crisis in the West leaves incomplete Polish plants, narrow credit channels and reduced possibilities of exporting to the West. The disorder of world prices doubles the cost of Polish imports and halves the value of Polish exports. Poland is losing one of its fundamental characteristics: it used to be the only country in the Soviet bloc that divided its economic exchanges equally, almost geometrically, between East and West; indeed, before the crisis the West had reached a level of 54 percent. Whether intentionally or not, whether explicitly or not, the economic balance implied a political option. This has been reversed in the Polish economic crisis.

Even before, the Soviet Union had placed serious restrictions on it, taking advantage of the unfortunate structure of its industry, which was based on metallurgy when it had no metals, on textile production when it had no fibers or yarns, and on big machinery when it had no fuels of its own. In fact 100 percent of Poland's natural gas comes from the USSR, as do 70 percent of its oil, 70 percent of its iron, 65 percent of its cotton and 50 percent of its woodpulp.

The Polish economy's almost organic dependence on Russia has increased now that Warsaw has had to seek outlets in the Eastern bloc, partly because its goods are no longer saleable in the West and partly because its trade balance depends on the preferential oil and raw materials prices which Gierek and Jaroszewicz manage to secure from Brezhnev and Kosygin. In recent years exports and exchanges with allied CEMA countries and specifically the USSR have been increasing by over 10 percent annually.

Nobody hides the fact that this reversal is worrying the leaders rather than pleasing them for having found alternative markets. The Polish government, responsible for an economy "ostracized" from the West, cannot see how to satisfy the great aspiration to produce and compete at high technological levels on the world markets. If the Poles are restricted or remain below hoped-for levels in the majority of industrial areas, they attributed it to the fact that the economic situation in the West has proved worse than expected. "Our mistake was to have miscalculated, but we console ourselves with the fact that the West also made an error."

What is the solution to this twofold error? The answer leaves no doubt, even regarding the basic reason for the prolific talk in Warsaw: "The West has two choices with respect to us: either to provide further credit and raise exchanges to a high level, thus giving us a chance to pay back our debts, or to deny us credit and maintain the economic barriers, thus forcing the Polish economy to close in on itself and on the narrow area to which it belongs and forcing us to resort to other alternatives. It does not take a great deal to realize that, as far as the West is concerned, the former is the better path."

Though not admitting their crisis, they seem at least as keen as [words indistinct]. They hope to be able to halt the inversion in their economic relations and to recover the balance between East and West which formed

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the basis of Poland's ambitious programs. Nevertheless, I asked, is it possible for all the difficulties of a socialist economy to stem from the disasters of the capitalist economies?

Ever since I have been coming to Poland--and I have been coming for 20 years now--I have felt as if I were witnessing the construction of a large aircraft which, in order to insure greater independence in flight, became increasingly large and heavy in design: so much so that, the further the construction progresses, the less able it is to take off. Indeed, it seems to me that the Poles are still not flying with their economy. The answers which I received were somewhat irritated. One person [word indistinct] to me that small and more mobile aircraft can only be constructed by someone who has first constructed a larger one. Another person maintained that, even if there has been "overinvestment," there was no alternative.

The third explained to me that at this very moment work is underway to free the aircraft of excess baggage and thus allow it to take off. These are the arguments: Poland has developed by increasing investment by 25 percent annually (the Western average is 3-5 percent) and by spending 38 percent of the entire national income on it (level with Japan). This was necessary with a view to providing employment for the 3,5 million young people born during the population explosion which followed the war holocaust. The birth rate has now fallen from 2 million to the "normal" level of 400,000 annually.

The euphoria of investment was also accompanied by a dizzying (thanks to the chronic workers' uprisings) 40-percent increase in wages, while at the same time the offer of goods on the market increased only 18 percent. Thus, more and more heavy and full of passengers, the Polish aircraft failed to take off, in an atmosphere which one of my authoritative interlocutors described as one of "tension in the foreign balance and tension on the internal market."

Talking of tensions, I am reminded of an anecdote heard here in Warsaw at the time when, with Gomulka overthrown by the explosion of the Baltic workers' impatience, Gierek took power and promised to remedy the precarious economic situation, which was ascribed precisely to his predecessor's despotism. The Poles wondered: "What difference is there between Gomulka and Gierek?" And their answer was: "None at all, except that Gierek does not know it yet." After 9 years he should have found out. How and to what extent he has done so is the subject of my next article.

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