



# Alternative futures for Kiruna

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**In this second part of our analysis of Swedish iron ore industry we have interviewed miners and discussed the projects they have presented as alternatives to the grim future outlined in Raw Materials Report Vol 1 No 1. Since autumn 1981 the situation in Kiruna has deteriorated and several hundreds of workers are now threatened with dismissal.**

The interviews of March 1981 and the discussion about alternative futures were made by Bertil Isaksson and originally published in the Swedish weekly *Folkviljan* (no. 11 and 9, 1981) with which RMR has a cooperation agreement. The interviews of April 1982 and all other texts were written by Magnus Ericsson. Magnus Ericsson is a member of RMR's Editorial Group, Bertil Isaksson is *Folkviljan's* local correspondent in Gällivare.

Since the beginning of the 20th century when large scale iron ore mining started in northern Sweden the towns of Kiruna and Malmberget have been completely dependent on LKAB and hence on the world market for iron ore for their survival.

## **New strategy needed**

During the boom of the 1950s and 60s the main goal for LKAB was to mine as much ore as possible. What could be produced could be sold with profit. But in the 70s this strategy turned out to be disastrous. Not only was the iron ore market plummeting but LKAB had also lost the possibilities to diversify when there was still time and money to do so.

This export oriented strategy had many reasons:

- One was the high price paid for LKAB by the Swedish state in 1957 when the company was nationalized, more than 900 million Swedish crowns (SEK) in cash. From a business economic point of view this huge investment called for very high production levels to get "the necessary return on investment".
- Another reason was Sweden's unqualified support for the doctrine of free trade, as formulated in the GATT agreements of 1947. At that time the doctrine was very profitable for the Swedish iron ore industry. Now this situation has changed but the Swedish government is not prepared to discuss any form of market regulation that could limit the present over-supply of iron ore.

The problems of LKAB show how difficult it is to develop a prosperous mining community and a diversified regional economy within the global capitalist economy. It does not matter that the mine is located in one of the world's most advanced industrial countries or that the mine has been 50 per cent state owned since 1907 and fully state controlled since 1957.

In our opinion the death sentence hanging over Kiruna and Malmberget is a

result of the restructuring of the capitalist world iron and steel industry. The closing down of mines in the industrialized countries is part of a global TNC strategy to maintain control direct and indirect over raw material suppliers in the "Third World" and over the world market for iron ore. This in turn is absolutely essential for the possibility of restructuring the world steel industry.

Another factor of importance is the Swedish government's policy of supporting the Swedish machine industry's export capabilities. Such an export-oriented policy also calls for continued and unqualified support for the free trade doctrine which leads to diminished ore and steel production. As a matter of fact Sweden imports large quantities of raw steel.

However, during the last years various suggestions of alternatives to the present export-oriented iron ore industry have been put forward by trade unions, political parties, local and regional authorities. Numerous studies and reports have been published. These alternatives are interesting, not so much because of their technical ingenuity, but because they prove the necessity of establishing a more democratic debate to develop and evaluate new ideas and projects, outside the traditional business and academic communities.

## **Control of development through technology**

If mine closures is one side of the coin the other side is the rapid expansion into the world market of the Swedish mining equipment manufacturers and mining consultants. Some Swedish companies are well known leading TNCs in their fields, such as Atals Copco and Sandvik drills and drill bits, SKEGA rubber lining, Nitro Nobel blasting systems. All these companies play an important role in a global strategy aiming to secure access to natural resources, not primarily through direct ownership of mines but through control of finance, mining technology and processing of these resources. ■

## **BOTOLF BRANDEBO - MARCH 1981**

Botolf Brandebo is 45 years old. He's been a miner at LKAB for the last 12 years.

- Every morning I go to work thinking about the diesel fumes. I think my life is getting shorter everyday because of them. I've thought about quitting quite a few times but I just keep working. I want a job and I'm not prepared to move again for a new one.

Botolf loads ore in the mine. It's a heavy, dirty job. He alternates on the job, working two hours loading at a time and then two hours somewhere else. Diesel fumes from the trucks and dampness fill the mine shafts. The haze is thicker than the pale yellow lights reveal. Even though the mine is ventilated, Botolf is always surrounded by fumes. He's back on the job after being on sick leave for a damaged knee. Actually he should still be at home but he felt better and didn't want to stay at home. His knee is going to be operated on.

### **Afraid of the diesel fumes**

- I'm afraid of our working conditions, afraid that the diesel fumes are affecting my body. When I worked as a driller in the Svappavaara mine I was surrounded by oil fumes all day long. Later I had a kidney removed and I suspect that there's a connection with the oil fumes. But the doctors said there was no evidence.

- Even though questions concerning our working conditions are so important, the unions haven't been able to make an issue of it because of LKAB's present financial problems.

### **Power to the union**

Botolf feels it's important to be an active union member.

- Party politics shouldn't play a role in the union. Our strength lies in a unified struggle for jobs, better working conditions and higher wages. I feel that the

union should have more influence on company decisions but that it shouldn't take control of the company.

- To have the support of its members, the union should always consult them.

- Members should attend union meetings, say what they feel is important, listen to others and feel the mutual solidarity that does exist. Despite the crisis, the lay offs and falling wages, the workers are not in a rebellious mood.

- It's a fact that some of the workers accept and even approve of being laid off. There are reasons for that. People would rather be at home than face the dangerous working conditions of the mine.

- I'm afraid that people won't react until their wallets are empty. When we have union meetings in my work area only 10 out of 170 come. That's really bad.

- The union has to break its bonds to the social democratic party. There are good people in all of the workers parties. Of course union work is political but that does not imply a one-party tie<sup>1</sup>. In union elections the right man in the right place is needed to make use of the best persons no matter what party he belongs to.

### **Longing to return**

Botolf was born in the small village of Saittarova in the Pajala district. At the age of 18 he had to leave for Malmberget to get a job as a driller in the mine. Later he moved to Fagersta in southern Sweden where he met his wife.

- But I was always longing to return to the North. I always felt like a stranger in Fagersta.

As soon as possible Botolf moved to Kiruna but his family couldn't get a flat there. And during several years Botolf and his family couldn't make their living in the North the way they wanted to.

<sup>1</sup> A majority of Swedish trade unions as for example the miner's union have their members join the Social Democratic party collectively.

They had to move to southern Sweden to get a job twice more, and twice they returned again.

They now have a house in Gällivare and four children. His wife Ingrid works at the hospital.

- I'm home now and I don't intend to move. Maybe to Saittarova when I retire.

The fact that Botolf wants to stay has made him interested in politics and union work.

### **Today's crisis**

- It's the unions who can and will show us the way out of this economic crisis. But unfortunately, union demands have never been taken seriously.

- LKAB's problems do not depend only on high freight costs. Trade with the countries in Eastern Europe has always been considered troublesome but I feel it would be better because that trade wouldn't be as sensitive to the ups and downs of the world market.

- It's perfectly clear that we have to stop transporting so much wasterock. Sponge iron is one example of further processing that would create more jobs. Swedish steel mills should obviously use Swedish ore.

- But LKAB's management are not interested in the above mentioned. A board which is not interested in solving problems is not worth keeping. If they change their attitude we could make use of them. If we feel that they have a goal worth striving for our working spirit would also return.

### **APRIL 1982**

- The notice given to 130 bluecollar workers and 70 whitecollar workers will be a catastrophe for Malmberget and Gällivare. Not only miners will be affected but also trade and municipal service. We know what it will mean. At least 50 per cent of the jobs in this district will disappear. And this is only the first round. There is a real risk that more notices will be given later. But today nobody is doing anything to stop it.





– The atmosphere in the mine is pessimistic. It is no fun to work any more. It seems as if people understand that the notices given will not be the last ones. But nobody will discuss the situation. The lads are dispirited and they say it does not matter what we do anyhow. Only the youngsters have some fighting spirit.

– I was prepared to go on hunger-strike to demonstrate that the situation is serious, but only some of my pals would join me.

– We will be laid off for another four weeks this summer, so the mine will be closed for nine weeks this year. At Kiruna they will close for another two weeks in the autumn. Being laid off we will only get 210 crowns a day from the union. This is about one hundred crowns after tax. The wallet probably has not become so thin yet that you feel that your existence is threatened, but when that happens the lads will probably be prepared to go on hunger-strike.

#### **Trade union without power**

– In the trade union we have not accepted the shut downs, but what can we do? We are forced to negotiate. The negotiations will start any time now and the only question up for discussion will be, who shall leave?

– The company has already decided how many must go. According to Swedish law the final notices must be given before the 1st of June if the dismissals are to take

place at the end of the year. The union demands that those last hired shall be the first fired. But LKAB wants to pick people whom they want to keep. They want to fire the old and let the younger people stay. In a way that may be right. They are young and the future belongs to them, but it will be difficult for many others. Today workers in the mine retire at 60. Before we had the possibility of an early old age pension at 58. But now they have only offered this to the whitecollar workers and many of them have accepted. They want to create an elite which will stay in the mine.

#### **Alternative jobs**

– We have pressed hard for alternative employment. The trade union has pointed to apatite works, fertilizer production and sponge iron as alternatives, but LKAB has said no. It is not prepared to invest any money on its own, but might consider managing a new company, provided the government puts up the money. We have called upon the Minister of Industry, Mr Åsling, in Stockholm and have discussed our proposals with him. But it seems as if the government only wants to give us emergency jobs.

– Something radically new must happen up here. Now it seems as if everybody in the mine just thinks that "when we get a new government after the elections this autumn" everything will be alright. But I

don't think it matters what kind of government we get, socialdemocrats or non-socialists.

#### **Employee consultant**

– The company has accepted a union demand for an employee consultant. Personally I don't believe much in this, but it depends on whom they appoint. It is like when they moved the head office to Luleå. That hasn't meant anything to us. Maybe the management thought that by moving it was giving us something. But Viking Sjöstrand is never there. "He is out in the world selling ore" they say when you call at the head office in Luleå. But as far as I know he has not sold very much. The change in management last year has not changed things.

#### **Close down**

– In the long run LKAB wants to close down the whole mine at Malmberget. We survive only because our ore is of better quality and today they are mixing ore from Kiruna with ore from Malmberget at the Kiruna mine. The company has proposed the construction of a reloading station here at Malmberget. They plan to send more ore here from Kiruna for mixing. In this way mining here would decrease with maybe one million tons. But so far the union has stopped this.

#### **Sales to Eastern Europe**

– We have suggested increased sales to Eastern Europe. The sales department says that they have studied the possibilities. Now sales to Poland have decreased a lot (about one million tons). We have also lost big customers in Britain in connection with the plans to build the big steel works in Luleå called Stålverk -80. In the mid 70s the sales department said there would not be ore enough in the early 80s for both exports and for local processing so the British started to buy from other sources.

<sup>2</sup> According to Swedish law the union has the right to have full insight into a company's affairs and can also take help from economic experts. ■



**STIG ERIKSSON**  
**MARCH 1981**

Stig Eriksson, 31 years old and a driller at the Malmberget mine says:

- The union leaders have to listen to their members and try to activate them.
- Our union has done a lot of good things but it should press the issues of more processing and diversified production. They should co-operate with those institutions where knowledge is to be found. One example is the technical branches of Luleå University.
- So many good ideas have emerged, for example production of sponge iron and fertilizer.

#### **LKAB - next to nothing**

- To blame LKAB's financial crisis only on a badly organized sales department or a lack of understanding is hardly the whole truth. LKAB plays an insignificant role on the world iron-ore market. Behind the scenes there's a game being played by the financial groupings with their multinational companies controlling sales and production.
- As an ordinary worker it's difficult to understand the game. But we have to learn that workers' and union solidarity across national borders is important. If we help miners in Brazil to raise their wages, we're helping ourselves.
- As a miner, one has to try and find out how the system works, read a lot and be active in the union.

#### **Laid off**

Stig has worked in the mine since 1973. Most of the time he has been up front drilling for drifts and for caving. They say it's the heaviest job in the mine. Both physically and mentally. But Stig likes his job.

– Of course there's a lot of noise, dust and exhaust fumes in the mine. And dirt. But you get used to it. Anyways there's not enough time to think about problems. The thought of something serious happening, like a cave-in, is pushed to the back of your mind.

Stig will be laid off again this summer. So two weeks before and after his vacation there will be no work. Between the 22nd of June–14th August the mine will be shutdown. By dividing the shutdown period into two parts, before and after the after the holidays, the company gets away with paying part of our wages. Being laid off costs me 1 300 crowns which is quite a lot for a family supporter especially as my wife cannot find a job.

#### **High rent**

Stig lives with his wife and two children in a three room apartment in a fairly new area outside of Gällivare.

- The rent has gone up another 200 crowns a month now. My wage increase in this year's agreement was between 250 and 300 skr. After taxes the wage increase doesn't even cover our rent increase, says Stig.
- In the future, unions must include rents and food prices in their programmes.

#### **Another kind of standard**

- I don't think that we should have a higher standard. We shouldn't have to consume more things like video tapes etc. There are other things in life than just material standards. Leisure time. And the future of our children. Parents have to have more time together with their kids. Now the parents are so tired every night and on weekends that the children suffer for it.

– And when the kids graduate from school there's only a hopeless future waiting for them.

– A more meaningful leisure time and vacation is another standard which is important, even though they are not materialistic.

#### **Bad feelings**

There are a lot of bad feelings in the mine right now. Pessimism can be found everywhere. The work spirit has sunk quite a lot, solidarity likewise. That's not so strange after all the pessimistic reports we've been receiving. But if people have a meaningful work then they naturally take responsibility for the job.

#### **APRIL 1982**

All in all we are about 1 700-1 800 employees here at Malmberget. LKAB has not said exactly how the notices will hit us. But we know that 130 bluecollar workers and 60-70 whitecollar workers will have to leave, beside those who will retire in the next few years.

- I think the reason that Malmberget has done fairly well despite all difficulties is that we have a better ore. At Kiruna the ore contains more phosphorus and alkali, but on the other hand they have much larger volumes of ore at Kiruna. Otherwise the company had probably preferred to close down completely at Malmberget.

#### **The weakest hardest hit**

- The company says that it will dismiss personnel of all categories, but how will they be able to do that when we already are very few in the mine? During the 1970s new jobs have been created above surface for those who have used themselves up in the mine and cannot stand it any more. The company will probably dismiss them first. The weakest will be the hardest hit. But I think there is a rea-



*From left to right:*  
*Stefan Skoglund, 34, welder.*  
*Leo Keiso, 48, driller.*  
*Tauno Rantatalo, 49, ombudsman.*  
*Karl-Göran Asplund, 32, welder.*  
*Assar Wägström, 52, buyer.*

sonable alternative. Those who are 58-60 years old have often worked in the mine for many years. They could get a decent pension and save the jobs for younger people. In many countries miners retire at a lower age. We have to hope the company will start thinking that way.

— Neither has anyone of the people of LKAB explained the reasons for the notices. When Viking Sjöstrand and Björn Wahlström were appointed last autumn they were talking very big. 25 million tons of ore should be sold. Now we are down at 17 million tons. And all they talk about is reductions to fit the demands of today.

— At present LKAB is dealing almost only with Common Market countries but the steel works of Central Europe are at a standstill now, so one might wonder how much LKAB can sell this year and next year. They should have looked for new markets. Of course one is afraid of further notices with such prospects in view.

— In the trade union we stand united behind our demands. We especially want the apatite works and the iron sponge unit. And there are many other ideas on alternative production. We have also decided to say no to the notices.

— But when it comes to the question of *how* to proceed, there is a split in the trade union. So far nothing has happened. There have been no proposals about how to fight the enemy but negotiations. Earlier we had agreed that if LKAB wouldn't listen to the demands of the union we should turn to extra parliamentary methods. At the meetings of the trade union we all agreed on this, but now no one will take any further action. We all support our union, but it has to push harder to get our demands through. It is tough but something has to happen before the summer.

### Study trip to Brazil

— The Board of LKAB, including representatives of the trade union have been to

Brazil to study the iron ore mines. The results were meagre. Our representative, Hans Larsson, was impressed by the way railway transports were handled. Otherwise it is easy mining, no underground work and cheap labour. Trade union activity was directed by the companies and the junta, but that we already knew.

— We have discussed four alternatives concerning Malmfälten which have been elaborated by a working group, including people from the Stockholm School of Economics. We can't add much, These alternatives contain nothing new. LKAB wants to close down the mine now.

— We ask ourselves if the government really wants to save LKAB. We can't even be sure that the Social Democrats want to do it if they return to power next autumn, which is likely. Not even Palme dares to touch upon this question. He was asked for his opinion the same day as the notices were given. But he could not promise anything. *The will to do something is completely gone.* Many studies and calculations have pointed at profitable alternative production, but still nothing happens.

### Who governs?

— One can ask oneself who actually governs this country. Maybe it is those who have invested in this business and trule the iron ore market? Like Brazil LKAB has tried to borrow money for investments from the Common Market. But the Common Market countries don't invest their money for nothing. They want something in return — like cheap ore and influence. Our union has said no to money for LKAB from the Common Market. It would be pure madness; they lend us money and of course they want something back. Then it would be us against the miners in Brazil. With EEC as part-owner all of a sudden they may decide that for instance Svappavaara and Malmberget must close down. We would be at their mercy. ■

### "WE BELIEVE IN THE FUTURE" Round-table discussion, March 1981

**Leo Keisu:** Of course I believe in the future. I have to. I was forced to move from Tornedalen to Kiruna. My children are not going to be forced to move. They have to feel at home somewhere - it's their right.

But we can't just continue being raw material exploiters. The iron ore has to be processed further so that it will last longer and give more jobs. At the moment it's impossible to sell ore to our customers. Today we import steel to Sweden while exporting iron-ore. I feel this is totally wrong. The *pellet works* built recently in Kiruna could be the first link in a chain of processing.

**Stefan Skoglund:** Even the engineering industries would benefit from increased processing of LKAB's products. We could receive some of the raw materials from Kiruna. That's just one example of a possible future, so of course I believe in the future. If only the power and the will for change were to be found in the right hands. But without LKAB it would be difficult for our industries to exist. We've all grown up in the shadow of that mining company. The privately owned industries with their short-term profit motives are an obstacle to change.

Like Karl-Göran Asplund, Stefan works at Rönquist and Wettainens mechanical workshop, owned by two families. 25 of the 83 employed there have been given notice of dismissal starting April. There is not enough work available. Nearly two thirds of all the work is done for LKAB. Some of the jobs are contracted and the rest are production of shovels to front-loaders. The future is uncertain.

**Tauno Rantatalo:** You're damned right I believe in the future. It would be sheer madness to leave everything; investments, buildings, social services and people. But it doesn't look too good. Over 18 per cent of the construction workers in Norr-





botten were unemployed in January. We can't build houses that stand empty. Houses that people can't afford to live in. The villain is an industry who doesn't invest in the future - but instead speculates.

### Alternative production and the need for a planned economy

**Assar Wågström:** Certainly there's a future in Kiruna. However, the engineering industries have to start producing their own products and become more independent of LKAB. Our best hope today is the copper mine opening in Viscaria.

**Karl-Göran:** Many of our hopes and aspirations require a planned economy. In a planned Sweden even Kiruna would be needed. In that Sweden resources would be controlled by needs.

**Leo:** One such need is *fertilizer*. It would create meaningful employment. Apatite - the raw material in commercial fertilizer - is now shipped to Norway.

**Assar:** Fertilizer would be one way to vary our activities - to create a more diversified economy.

**Leo:** A fertilizer industry is less susceptible to the ups and downs of the market. That's important for us in Kiruna.

**Assar:** Concerning the *copper* in Viscaria, LKAB has to decide to process the ore as much as possible, right from the beginning. Why not smelt the ore in Kiruna? I think it will be difficult to cooperate with the private companies that will buy the

ore. Personally I believe there is more copper in Kiruna than Viscaria. But we don't know officially. Four different authorities are conducting surveys and are very secretive about their findings. The prospecting has to be coordinated.

**Tauno:** The Viscaria mine should mean a lot of construction work as long as LKAB doesn't build with its own people.

**Assar:** But the miners' union doesn't like contractors. According to the union only LKAB employees should get the jobs.

**Leo:** In the union we say, that what we are capable of - we should do. It's ridiculous sending us away while at the same time contracting other workers. When the work situation is over-heated, workers from the outside should be permitted in.

**Karl-Göran:** When the economy is bad there's a risk that unions will fight amongst one another for jobs instead of working together for a smelter-works, as one example.

### Mining equipment production

Another possibility for Kiruna is to build an engineering industry around mining equipment. The company would have to find other customers than LKAB. A foundation for that industry already exists.

**Leo:** Cooperation between LKAB and its contractors is important. It should be obvious that LKAB should buy its equipment from domestic companies instead of foreign competitors.

### North Sea gas

**Assar:** Do you think the Norwegian gas could help Kiruna?

**Leo:** The gas hasn't even been discovered yet. In the long run the gas could be used as an inexpensive fuel for the processing of the ore. The pipeline would have to be built farther than just to Kiruna.

**Assar:** The gas will hardly solve our most urgent problems.

### Peat

**Tauno:** But we have *peat* and *graphite* which could be converted into fuel industries.

**Assar:** City hall talks a lot about the enormous peat resources available but at the same time they have started to build a heat and power plant which is to be fuelled by oil.

**Leo:** When it comes to the peat we have to be careful that the jobs stay up here. There is a risk that contractors from the south could take over.

**Assar:** That's why we shouldn't worry people about the peat findings. The local companies should first develop their methods, taking the time they need. The state should control the peat lands to stop any eventual speculation.

A positive attitude towards the future can be found in Kiruna. The situation is painted black but the unions have suggestions and ideas about the future. The question is who is going to materialize these ideas in today's Sweden. ■



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## Fertilizer, apatite

The iron ores in northern Sweden have a fairly high phosphorus content. With new technologies in the steel industry this has become a disadvantage in the world market and LKAB has built a plant for extraction of apatite (the phosphorus containing mineral) to reduce the phosphorus level in the ore. At the same time LKAB has been able to sell the apatite as a raw material for fertilizer production. Buyer is the Norwegian chemical group Norsk Hydro, one of the world's leading producers of nitrogen containing fertilizers and a rising power in Scandinavian business in general. Another apatite plant is now planned to be constructed in Malmberget. However, the ore in Malmberget has a high chloride content, which makes it less suitable for fertilizer production.

The general trend of using the by-products of iron ore is strongly supported by the trade unions. However, the present policy is criticized for two main reasons: First LKAB is only selling a raw material, not a processed product and second the apatite contains a high concentration (0.8 per cent) of rare earth metals (REM).

A long standing demand from the unions has been an integrated fertilizer production and a plant to extract the REMs. Recently an evaluation, based on conservative economic assumptions, has shown that a fertilizer industry, using locally available raw materials, is economically feasible. The basic concept in this study is to integrate various by-products from existing mines and new raw materials into a competitive process which gives a high quality, cadmium free NPK fertilizer.

The main obstacle to realize this project is the present structure of the fertilizer market in Scandinavia where Norsk Hydro is completely dominating. A production of fertilizer in northern Sweden would be a direct threat to the monopoly of Norsk Hydro.

## Copper

Today copper is only produced in the publicly owned Swedish mining company Boliden's Aitik mine located close to Malmberget.

In the early 1970s LKAB discovered an ore body containing copper almost within the iron mine site in Kiruna. The ore body is called Viscaria since it was first indicated by the small mountain flower, *Viscaria alpina*, which often grows where copper is present in the soil. The mine is scheduled to start operating in 1983 and to give about 110 jobs. The copper content in the ore is 2.5 - 3 per cent and the ore body is considered to have at least 25 million tons ore which is technically and economically possible to mine. The investment needed is 350 million SEK of which 160 is supplied by the Swedish state. This investment equals 17 400 SEK/yearly ton of copper mined. (In April 1982 1 SEK = 5.90 USD.) The ore will be concentrated in Kiruna and then sold for refining. Concentrates containing 21 000 tons copper has been sold to a Finnish smelter and to the Swedish conglomerate A Johnson & Co for a six year period.

The main problem today is the price of copper. The breakeven point lies around 9 000 SEK/t. In early 1982 the LME price has fluctuated around between 8 000 - 8 500 SEK/t.

## Sponge iron

The international market for pellets is at present very competitive. One way to improve the situation would be to refine the pellet into sponge iron. This is the next step in the production process from pellet to iron. Internationally the most widely used production method is the Midrex gas reduction process. Similar processes have been developed in Sweden. Based on these methods and gas generated from peat, an energy source in plentiful supply in all northern Sweden, a product more

attractive in the world market than the high phosphorus ore could be produced. It has been reported that steel produced in this way in northern Sweden would be 3 per cent cheaper than steel produced by conventional methods. It has also been suggested that natural gas, from the potential gas fields in the North Sea, north of the 62nd parallel outside Norway, could be transported to the markets in central Europe through Sweden. This gas could be used for sponge iron production in Kiruna in the 1990s.

## Silicon

Quartz is available in the region both in suitable ore bodies which could be opened for this purpose only and in waste sands from mine concentrators particularly at the lead zinc mine in Laisvall owned by Boliden and in the Aitik copper mine. It has been suggested that this quartz should be used as a raw material for ferrosilicon production. In this was the silicon, also used as an important additive in the pellet production, which is now imported from outside of the region, could be substituted with local production and a certain export could probably also be established.

## Aluminium

Various possibilities to develop processes for the production of aluminium from other sources than bauxite could be of great importance to Sweden. Today all aluminium for metal production is imported. Raw materials such as muscovite in the sands from the Aitik concentrator and nepheline syenite from other parts of the area are presently studied.

## Graphite, lithium, rubidium, REM

Ores known to contain minerals with graphite, lithium, rubidium and several rare earth metals are located in northern Sweden. A research program to develop new methods to mine and refine these deposits is under way.