

NUCLEAR SECURITY IN KAZAKHSTAN AND UKRAINE: AN INTERVIEW WITH VLADIMIR SHKOLNIK AND NICOLAI STEINBERG

Conducted by William C. Potter, Emily Ewell, and Elizabeth Skinner

INTRODUCTION

In August 1994, Vladimir Shkolnik and Nicolai Steinberg were Visiting Fellows at the Program for Non-proliferation Studies (PNS) at the Monterey Institute of International Studies. Vladimir Shkolnik is the former head of the Kazakhstan Atomic Energy Agency and recently was appointed Minister of Science and New Technologies in Kazakhstan. Nicolai Steinberg is the Chairman of the Ukrainian State Committee for Nuclear and Radiation Safety. The following interview was conducted by Dr. William C. Potter, Emily Ewell, and Elizabeth Skinner. "PNS" designates questions formulated by this group; last names are used to designate additional questions. Alexander Mikheev served as the interpreter.

PNS: Please explain for us the role that the State Committee for Nuclear Radiation and Safety plays in the nonproliferation field.

Nicolai Steinberg: In the field of nonproliferation, our committee is responsible for the State System of Accounting and Control for nuclear materials (SSAC). We have already developed a SSAC which is currently being put into place. Our committee is responsible for regulation in the sphere of physical protection of nuclear materials, and some of the activities relating to their export and import. Directly connected to this sphere is activity relating to the regulation of safe transportation of nuclear materials.

PNS: Can you tell us about the role the Committee plays in the export control area?

Steinberg: This is a difficult question because the system of export/import controls has not yet been established. The system is in constant flux, as it were. We have a State Commission on Export Controls and an Expert-Technical Committee of the Cabinet of Ministers.

Potter: Would you please describe the relationship between these two bodies?

Steinberg: The Expert-Technical Committee is the executive arm of the State Commission, which reserves the right to approve or reject the Committee's export license recommendations.

Potter: You said that an export control system has not yet been established, but you speak about organizations that have some responsibility in the export control area. Why do you not regard a system as being in place?

Steinberg: We can say the system is in place when we have a body of law, a legislative framework, a legal foundation, the responsibilities are assigned, and everyone is aware of his duties. Also it usually presupposes the existence of technical means to ensure con-

trol. Or, to use a popular phrase from the time of the existence of the Soviet Union, “the border is under lock and key.”

PNS: Would you say a little bit more about the activities of your Committee in the export control arena?

Steinberg: We started out very actively, because we believed that export/import controls would be placed within the sphere of our direct responsibility. But then the activities were reassigned, so we were left with rather modest responsibilities. Currently, we make sure that the materials, technologies and equipment that are covered by the appropriate documents of the Nuclear Suppliers’ Group are under control. Eighteen months ago we prepared a draft regulation relating to the procedure of export /import control of nuclear materials. We submitted this draft to the Cabinet of Ministers. However this draft has not yet been approved. For the time being, we have a relationship in which we understand what needs to be done, and the other side understands that they need to request certain things of us.

Potter: In the last year, has the State Committee approved any exports of nuclear materials or dual-use goods?

Steinberg: We have only been approached for permission to export nuclear materials.

Potter: Can you say what kinds of materials?

Steinberg: Only uranium.

Potter: Not heavy water?

Steinberg: I think there was one request. There was not a single other request. Ukraine is the only place that produces zirconium in the entire territory of the former Soviet Union. Scandium, also only in Ukraine—and in Kazakhstan.

Vladimir Shkolnik: A lot of it in Kazakhstan. Tons of scandium.

Steinberg: [We have received requests for] high-pressure pipelines and pumps for nuclear installations.

Potter: But these are not being exported now?

Steinberg: Why not?

Potter: But these are dual-use goods, and you said that no dual-use goods were being exported.

Steinberg: They are not being controlled, but [they are being] exported.

Potter: There is a real problem here that illustrates the absence a real export control system. In principle, these goods are supposed to be controlled, but in practice there is not a mechanism to control them.

Steinberg: Yes.

PNS: What would you identify as the major problems in the export control sphere?

Steinberg: The major problem is adopting normative documents. Legislation.

Potter: But there are decrees that have some element of legal standing?

Steinberg: Yes, we do have those, but they do not cover the entire area. I’ll give you just one example. There is a decree stating that you cannot import used cars without a tax being put on them. This is a very important problem. Having this paper, the frontier guards would ask what is the nature of the cargo. Old cars? Pay the tax. What are you shipping? I’m shipping zirconium. Go ahead, no tax!

Potter: But here we’re talking about the actual guards at the border. What we’re interested in is the role of the State Committee. As I understand it, the Committee is supposed to be approached by the Export Control Commission for approval of export licenses for nuclear items, including dual-use items like zirconium. We recognize there is a problem with customs controls, but is there also a problem where the State Commission is supposed to first ask the Ukrainian State Committee for Nuclear and Radiation Safety for approval of export licenses for zirconium?

Steinberg: Zirconium may not be the best example, because zirconium is covered by another decree concerning nonferrous metals. But in order for the Commission to look at a matter from the point of view of

dual-use, it must have a document. We prepared that document 18 months ago, and since that time it's been sitting there, on the waiting list.

We should not try to make it a mystery. Some people are scared to talk about problems that really exist. Now let's look at reality. Our state is only two years old, Kazakhstan is also only two years old. It is unthinkable that any state in only two years can prepare a comprehensive body of legislation.

Potter: One can understand all the very real difficulties involved in establishing an export control system in only three years, but a precondition is governmental commitment to the idea of export controls. I'm curious about your perception of how committed the government is to this nonproliferation issue.

Steinberg: It's a most difficult question. Politically, the commitment of the government was made a long time ago when the state was first created. It's another question whether we have the capability to implement that commitment. To be quite frank with you, I don't believe we have the capability to implement it, and I don't see us having this capability in the foreseeable future.

Potter: But does the commitment still exist?

Steinberg: By all means. The commitment has been expressed on many occasions. For instance, on August 21, 1991, the Parliament made a relevant statement. Then in October or November the statement was reiterated. And again, after the referendum on December 5, another statement was made to the same effect. So the commitment is there, and Ukraine has emphasized on several occasions its intention to adopt a body of law relating to nuclear nonproliferation [like that which] currently exists in all states.

Potter: Let us somehow distinguish between a commitment to nonproliferation, which may have more political connotations, and the specific area of export controls. The question was, is the government committed to putting in place an effective export control system?

Steinberg: Yes, it does have that commitment, but it is not realistic at this time to implement this system. When all the documents are prepared, we will still need a

national technical means of verification to enforce the system. Think about it. In a regular bus, in the engine compartment, six sources of radioactivity are being smuggled across the border. The illegal activity is only revealed in Poland, because in Poland they do have the national technical means of control. To create such a system of technical controls all along the border will require massive investment.

PNS: Maybe now we can turn to the issue of physical protection and material control and accounting. And on this issue we'd also like to hear from Dr. Shkolnik.

There have been a lot of stories in the news media lately about the problem of nuclear smuggling. Russian officials have tended to deny that they are really responsible [for the diversion of nuclear materials], and argue that the material is adequately accounted for, saying that there is physical protection. We're very skeptical, in part from our own experience here in the United States. We know, for example that there are tons of material, tons of plutonium, that are unaccounted for. We don't know that it's been stolen, but we cannot really account for it.

So we would like to hear each of our colleagues talk about the problems of physical protection and material control and accounting. To what extent is it a real problem in their respective countries, what is the nature of the problem, and what can be done to fix the problem?

Steinberg: I understand that we have a range of problems there. Now let's talk about physical protection. We are successors to a "concentration camp" state. The system of protection in such a camp is designed so that those inside the camp cannot get out and flee. So the system of physical protection of nuclear material [which was in place] does not meet the standards that currently exist elsewhere in the world. We understand this, and we are currently working to bring it up to an appropriate standard. I mean in accordance with acceptable standards that have evolved elsewhere in the world, because our own intentions do meet the standards that we have set ourselves, inside our own system.

Potter: If I understand the analogy to the concentration camp, the idea is that perimeter walls exist to prevent the flow of materials, or peoples, across the borders. But there is not much of a focus on diversion within.

Steinberg: Absolutely. So let's take a look at the second question now: How effective is the system of physical protection? I don't believe it is effective now, and I'll tell you why. The reasons are economic and psychological. Vladimir [Shkolnik] and I have worked in the nuclear industry all of our lives. We know that sometimes you are called to work at one o'clock in the morning, you work 24 hours a day, you work without holidays, vacations or anything. This is the first time in four years that I have been on vacation.

There was a time when our salaries were not worse than the salaries of other people in other industries. Maybe they were even higher. Today salaries in the nuclear industry have dropped significantly.

So it is a very interesting question: Can a person in the nuclear industry resist when he is offered a very attractive salary? Or say, a bribe? When a bribe is on the order of the amount of money he would earn in the rest of his life, I don't know that every person could resist, and still continue to carry out his duties.

Therefore, when you ask a question about the efficiency of physical protection, this is a question that doesn't have an answer. We were brought up to believe that the army is sacrosanct. Now tell me, where do the firearms that you can buy anywhere in the country come from? You can buy firearms in any market.

Shkolnik: If not in the stores.

Steinberg: Not only handguns, but machine guns, submachine guns. People have bought tanks, artillery, and even missiles. The events in the Caucasus region and the Dniester region bear witness to that. Everything is being sold out.

Potter: This would seem to be an argument for more concentration not only on physical protection, but also on material control and accounting, so that if one cannot protect against diversion, one is at least in a position to know material has been diverted.

Steinberg: I cannot say anything about those facilities which actually produce nuclear materials, but a system of accounting at nuclear power installations in the former Soviet Union never existed. That is, we had a system of accounting, but it did not meet the standards of material accounting which existed elsewhere in the world. There was no system of accounting for radioactive sources until 1984, and the system that was put in place after

1984 was very inefficient. You could not even call it a state system, because there was a separate system for the civilian industries, a separate system in the framework of the Ministry of Internal Affairs, and one set up in the KGB as well. And of course, the Army and the Navy had their own systems.

Potter: What was the purpose of the system in the Ministry of Internal Affairs with respect to nuclear materials? For material control and accounting?

Steinberg: They used radiation sources within the system of the Ministry for Internal Affairs, and the Ministry had a system of accounting for those radiation sources.

PNS: What kinds of uses would the Ministry have for radiation sources?

Steinberg: The Ministry of Internal Affairs had its own hospitals. It also controlled all prisons, which had their own production facilities. Radioactive sources were used there as well. Separate systems, something like that one, were also in place in the KGB and in the Army.

Potter: So before 1984 there really was no accounting system for radioactive material throughout the Soviet Union.

Steinberg: Exactly. There were several channels which were used for the transfer of radioactive sources, and they were not controlled at all. Suppose you buy equipment to roll steel from Germany, France, or the United States, and suppose there is a radioactive source that comes together with the rolling mill. These sources are not accounted for when this equipment is shipped to production facilities. So now that we have tried to establish a system for accounting, according to our data we have somewhere from 100 to 50,000 sources of radioactivity in Ukraine. This is the situation we are now faced with.

Potter: Let's look for just a moment at those sources that are of concern from a proliferation standpoint.

Steinberg: First, let me go back to the nuclear materials. If you read [Andre] Sakharov's memoirs very carefully, in either 1961 or '63 he protested against the

testing of extremely powerful nuclear bombs on Novaya Zemlya. He writes in his memoirs that at that time he developed the concept of a very small nuclear bomb. However, he was unable to have that particular project included in the decree published by the government, and therefore couldn't obtain the plutonium necessary to actually develop this bomb. But, he said he could glean the plutonium he needed from other research sources. Now this gives you an idea of the sort of situation that existed in the country. I cannot vouch whether this story is true or not, but this is what Sakharov wrote in his memoirs.

Potter: To relate this more specifically to the civilian sector, there are research reactors, critical assemblies, in Ukraine, Kazakhstan, and elsewhere. If I understand correctly, prior to 1984, there was movement of nuclear material...

Steinberg: I was talking only about radiation sources.

Potter: But I'm interested also in nuclear material. I understand there was no system for accounting of nuclear material, or rather sources, until 1984, right? Let's look now at the question of radioactive material. What kinds of materials controls were in place, and remain in place today?

Steinberg: It's hard to say. You need to ask through a different ministry.

Potter: Let me try to make the question a little easier to answer. When I was in Minsk [October 1993], I had a discussion with a senior official from the major nuclear research institute at Sosny. When I asked him how much highly-enriched uranium was at the facility in Sosny, he answered very candidly, "I can't tell you exactly. Maybe 33 kg, maybe 35 kg, we ourselves don't know." That suggested to me that there was not very good material control and accounting, and I'm assuming that a similar problem exists at other research institutes.

Steinberg: I will explain. Under the old system in the energy sector, we based our accounting on the number of fuel assemblies. We were not interested in how many kilos of nuclear material they actually contained. We knew the number of items. That information was necessary only for documentation when the spent fuel as-

sembly was shipped to Chelyabinsk to be reprocessed. That was the only thing we were interested in.

But generally speaking, for the VVER reactors, no one knew how many kilograms of plutonium, or whatever, were actually available. As for the RBMK reactors, the situation was still worse because the RBMK's spent fuel was not designed to be reprocessed. We are currently recalculating the whole situation, in order to determine how much plutonium, uranium, etc., we have. And the same is true of research reactors. The values were calculated, but only for the purposes of physical accounting, not for the purposes of accounting for what quantities were in each facility.

Potter: I have talked with people who are now trying to create a more modern system of material control and accounting. We were talking specifically about the fresh fuel for propulsion reactors. They described a similar situation where, at best, they counted the number of containers of fuel. No one really knew how much was inside the containers.

Steinberg: There was no demand for the information.

Shkolnik: If you go to a nuclear facility in the U.S., and you ask them how much plutonium or uranium-235 they have, no one will be able to tell you. If you want that information you should go to the appropriate office responsible for material control. They will make the appropriate runs on their computers, and they will be able to tell you the figures if you're interested. But the people at the facility itself can't do this. And the figures change. I'm talking here about the U.S., France, Great Britain. In Kazakhstan, you will need to go to a particular office and look at the computer data, rather than ask the director of the facility.

Steinberg: The question is different though, as to whether someone is able or is not able to give you a figure.

Potter: Maybe the situation is different in Kazakhstan?

Shkolnik: You should be aware that the scale of nuclear and radioactive material activity in Ukraine and Kazakhstan is very different. They are incomparable in scale. The problems of nuclear weapons are comparable in a way, but in Ukraine there are about 15 oper-

ating nuclear facilities, while in Kazakhstan we have only one, which is an industrial nuclear facility.

In Kazakhstan the uranium industry is very developed, but the problem there is of a different nature. So the situations are different, and the approaches we develop in our countries are also different.

I will briefly try to answer the question about material control and accounting. We have succeeded in adopting and publishing the appropriate regulations and decrees, and the government has adopted those decrees that regulate relations in this sphere. That is to say, the appropriate documentation does exist.

I personally believe that the number of publications in the media saying that diversion of nuclear materials from the FSU [former Soviet Union] was taking place, has diminished significantly over the past 12 months. That is, diversion from Kazakhstan. Just 18 months ago, I would frequently receive enquiries from the government saying I should look into a case of diversion of nuclear material. Now we don't have any such enquiries. If you have any such publications [about nuclear materials diversion], I would be grateful to see them.

Potter: We have a chronology of all the reports.

Shkolnik: In Kazakhstan the situation is somewhat better, in that we don't produce dual-use technologies.

PNS: Beryllium?

Shkolnik: I'm talking about equipment. We do have a wide range of dual-use materials, which are covered by INFCIRC 254, parts 1 and 2. I presented a paper on this subject. You know that the government has adopted appropriate regulations which are in line with INFCIRC 254, parts 1 and 2.

Now, as to physical protection. I agree with Nicolai completely when he says that the situation with respect to nuclear installations and nuclear materials is not in line with internationally accepted standards, and it was not in line with these standards under the Soviet Union. Again, in the Soviet Union, the approaches which were adopted with regard to different nuclear installations were not uniform. There was a difference in approach, even within the same ministry, toward defense nuclear installations and civilian nuclear installations. I have experience in both of these areas. I think this is only natural, and that the difference in approach between civilian and defense nuclear installations is probably

true in all countries. Without being judgmental, I would say that the approach adopted toward military, or defense, installations was much more rigorous.

Since 1984 or 1985, we have been developing legislation and regulations relating to physical protection. Such legislation is comparable to that existing in the U.S., which relates to the division of zones, and similar standard procedures. But we were even more actively involved in this work in 1989. We started in 1985, and then increased our activity. But then the Soviet Union ceased to exist, and we started sailing on our own, as it were. We published a special decree on the physical protection of nuclear facilities and nuclear materials. When we adopted it, in June or July of this year... .

Steinberg: Our regulation was adopted on the 26th of June this year.

Shkolnik: This decree upholds the same standards that exist elsewhere in the world, but the technical means to implement it do not exist. And here I would like to comment on the Nunn-Lugar legislation. We have a series of agreements with the U.S., which call for assistance from the U.S. to Kazakhstan in establishing an appropriate level of nuclear safety, a national system of accounting, and also in establishing state control of nuclear exports. As I said, the regulatory basis is already established. It is true that we still need assistance in streamlining our regulatory data exchange, transfer of data, etc.

Of course, customs services also need the equipment to enforce the regulations. I would say that none of the Soviet successor states can establish border controls as efficient as those that existed under the Soviet Union. None of them can do that. But the problem can be resolved. What is necessary is to establish control at the nuclear facilities, to set up a border, as it were, at the facilities themselves. So we weighed all these matters very carefully, and they were reflected in the legislation we published in our country.

Potter: Vladimir, I don't want to push too much on what the immediate situation is like in Kazakhstan concerning material control and accounting. But I do want to better understand the situation that existed in the past concerning the actual process of material control. Let's say, up to the time that Kazakhstan became an independent state. What I've heard before is consistent with the way Nicolai de-

scribed it for us today, and I want to know if you agree.

My understanding of the system for material control and accounting is that it was for general financial planning purposes. There was aggregate accounting, but it tended not to be facility specific. And it seems that the accounting, to the extent that it did exist, tended to be of an item nature—that is, you would count canisters but not inspect the materials inside. I've been told by very senior people in Russia that at many nuclear facilities there had not been a physical inspection for decades, if ever. I don't mean an inspection to count the number of fuel rods or containers of fuel, but a physical inspection to see, to weigh, to find out how much material was present.

Shkolnik: In order to answer this question about the former Soviet Union, one should be a minister or deputy minister in the Ministry of Medium Machine Building (Minsredmash). I can answer your question only regarding those facilities I am familiar with. I worked for a long time at a fast-breeder reactor [the BN-350 FBR in Aktau.] We did have a system of material control in terms of weight, but not for NPT [Non-Proliferation Treaty] reasons. This accounting system was very important because we had highly-enriched fuel there. Also, it was important for financial reasons at a time when large amounts of weapons were being produced.

So it was very important to have a system of accounting that would tell us what specific materials were in every particular facility, nuclear reactor, or any other place. Such a model was developed and tested experimentally. It was fine-tuned during the experiment and is currently used to insure material control and accounting at the fast-breeder reactor.

Potter: When was it introduced?

Shkolnik: The system became operative in the early 1980s. It was a computerized system, based on a 3-D calculation with the use of several nuclear constants, etc.

Potter: This is a model, but were physical inspections conducted to actually check and see?

Shkolnik: According to existing regulations at that time, a special commission was set up every year. This commission actually checked the presence and the quanti-

ties of materials existing in every sector of the facility, including the nuclear reactor zones. If any radioactive materials were used for research, if any of the assemblies were disassembled for whatever reason, the commission was charged to look into each specific situation and provide an account for it. They would make comparisons, and would set up a balance, an inventory, of all the materials. This inventory would then be sent to the fourth division of the KGB, which was supervising the activities of our industry. That was the procedure established by the fourth division, and the Chelyabinsk facility and other facilities were subject to these regulations.

Potter: These are military facilities.

Shkolnik: These are military nuclear facilities, but nuclear power stations followed the same procedures. So, the essential point is that control and accounting were established and implemented, but the approaches were totally different. Now, when we speak about safeguards, we are talking about the need to prevent diversion, another use of the same material. With the approaches to control and accounting that I am talking about, no one even thought about diversion or using the material for another purpose. I would in fact say that it was not possible at the time, because the system was such that any attempt would be known to everyone within five minutes.

Potter: I see that there is a contradiction between the different things that I am hearing today, and what I have heard from other experts. When I hear Vladimir speak based on his experience, I might come to the conclusion that we really don't have a problem with material control and accounting.

Shkolnik: I am talking about my own experience because I have been involved in this area all my life. Maybe my attitude was not the right one, but you should understand that I am confident that is the system that was prevalent. The aims or the purposes of the system were totally different from the ones that are currently being formulated.

Steinberg: Apart from the nuclear material that was at the Academy of Sciences.

Shkolnik: What I want to tell you is that the procedure

and the situation that existed in the Ministry of Middle Machine Building was not all that bad, and it worked, in contrast to the current situation.

Steinberg: The same thing is true about the Ministry of Energy. The worst situation was at the Academy of Sciences.

Shkolnik: We can say that the situation was bad within the Ministry for Higher and Specialized Education for the same reasons. If you followed the publications at the time you could have gathered that there was some kind of euphoria in the public. People believed that nuclear energy was readily available or accessible. But there was no such euphoria in Minsredmash.

Steinberg: It is not a question of whether the system was good or bad. The system collapsed, and it cannot be used in the current situation.

Potter: Here is the basis for my question. Viktor Mikhailov and other senior people in the Ministry of Atomic Energy have been saying that it is impossible that the material we are finding in Germany could come from our stockpiles, because we have checked and no material is missing.

I find that extraordinarily hard to believe, when we are talking about less than half a kilogram out of hundreds of tons of weapons grade material. We know from our own experience that we [the United States] do not have a perfect system, but I think we recognized earlier on the need to have a very well developed material control and accounting system. In our own system we cannot account for tons of material. There are measurement errors and all kinds of ways in which material is lost. You know the term “material unaccounted for”—MUF, as we call it. If you asked the U.S. Secretary of Energy today how much material has been diverted from the Hanford facility, she could not tell you, because we know there is a large amount of MUF there.

Is the head of the Russian Ministry of Atomic Energy really in a position, based upon the Russian system of material control and accounting, to state that all material is accounted for and that no diversion has taken place?

Shkolnik: This is a very serious question, so I would like to answer it very straightforwardly. I won't take the

responsibility of commenting on any of the officials representing another country, because strictly speaking I don't know the situation which exists today in a neighboring country such as Russia. I can only speak for the facilities that I control. But as a physicist, I do feel I'm in a position to comment on the pronouncements of these officials, including [those of] Mr. Mikhailov.

From the point of view of physical inventory, any system of material control and accounting has a certain degree of accuracy. Now let us suppose that the system of MC&A in the Russian Federation is strictly in line with the standards of the IAEA [International Atomic Energy Agency]. In that case, the accuracy of MUF sigma is only .3 percent. That's the kind of accuracy we get. Everything below this percentage is a mistake in the assessment of the situation as it is, so everything below that can or cannot be accounted for.

Let's take the facility at Ust-Kamenogorsk, for example. We have scales there which are used to weigh powder, or what have you, and every scale has a certain accuracy. Now if I'm smart enough, if I have a more accurate measuring device, and if I know that all the other people use scales which are less accurate, then without interfering with the system of accounting, I can devise a scheme to divert some of this material.

This is what I want to emphasize is a major problem today. What we need is to obtain equipment which is as accurate as possible. Other questions relate to negligence, stealing, and the collusion of officials who plot to divert material.

Steinberg: Another example: we have .3 percent accuracy, remember. According to official data, there are 90 tons of plutonium in storage in the Russian Federation, or 300 kilos of MUF, to give you an idea of what we're talking about. Now what is 300 kg? 50 warheads.

Potter: My point exactly.

Shkolnik: Again, you should understand that it's not easy to actually divert this material. From my experience based on the system that I worked in, I would agree with Mr. Mikhailov and say that it is not possible to divert this material.

Steinberg: But yours is a different case because your plutonium is in the reactor. You cannot actually go and take it out.

Potter: The problem is that in the past, for the first three years [after the breakup of the Soviet Union], there were lots of reports, all of which have proved to be false. What is frightening today is that for the first time, laboratory analyses have established that we have the real stuff. We have in one instance plutonium which is 99.75 percent pure—much more pure than what is usually used for weapons purposes. That is not something that a cleaning lady could have put in her pail and walked off with. This is a different situation, and this is why we are concerned today.

Shkolnik: Yes, I understand your concern. Again, let me emphasize that in talking about these things we cannot separate MC&A and physical protection. This is one and the same problem.

Steinberg: It is the social and economic situation of the countries. There was a catch phrase a couple of years ago, which is relevant today as well: there are no people who don't take bribes. It's another matter that some people take huge bribes. A lot of people who work in the nuclear industry didn't know that there was such a thing as a bribe. I would say that 95 to 99 percent of these same people in the nuclear industry have the same integrity, but among several hundred thousand people you will find a person who will take a huge bribe.

Potter: I agree that the underlying problem is economic, and for that reason I think that while we have to improve physical protection, MC&A, and export controls, we will never solve the problem without a change in the economic situation.

I also believe very, very strongly that former Soviet scientists and engineers are as loyal to their state as are scientists and people in the nuclear industry in the U.S. But I think it is counterproductive for senior people in the FSU's nuclear industry to deny the possibility of things which in fact are very probable.

Steinberg: I think Mikhailov and his spokesmen understand the situation, but they have been brought up in the socialist camp, just as the rest of us have. Even if half of the city burns down you say everything's fine.

Potter: But to the extent that there is a problem, and that it might be possible to help correct the situa-

tion, flat denials undermine the ability to provide funding to correct some of these problems.

Shkolnik: Yes, this is clear. I am an optimist by nature, and I think that the situation generally can be remedied. Let me restate what I have stated on several occasions: we have set up a technical coordinating support panel, which is designed to provide support to the NPT in Kazakhstan, and it is only just beginning to work. The Kazakhstan government is doing everything it can, within available capabilities and resources, to improve the situation. If we think about the ultimate result that we want to achieve, we need to move swiftly, but we talk too much.

You have to take into account bureaucratic traditions, etc. When a problem exists, you can live with this problem, you know. But since this is a concern that affects the entire world, we need to put all other problems aside and concentrate all of our efforts on this one. We must try to resolve it as quickly as possible, because we bear the responsibility for this.

PNS: In both Kazakhstan and Ukraine, there have been some comments by government officials about trying to introduce a complete nuclear fuel cycle. Please comment on whether you believe this is likely or desirable. If it's not likely, what are the problems?

Shkolnik: There has not been any official statement made about the future development of nuclear energy in Kazakhstan. However, I don't think that we can speak of any complete nuclear fuel cycle in Kazakhstan within the next 20 to 30 years. It is not only impractical, but also economically inexpedient.

Potter: What would be the first additional stages that would be introduced?

Shkolnik: You can speak of a nuclear cycle only if you intend to build up your energy production using nuclear power stations. So the first stage would be to upgrade and improve those facilities that are already operating, specifically the Ust-Kamenogorsk Combine. The next stage would be to replace the currently operating BN-350 reactor. After that, I would say, would be to install a couple of demonstration facilities in the Semipalatinsk area. And the next stage would be the construction of several power stations, with a capacity of 3 to 4 million

KW, within the next 15 to 20 years.

This kind of approach would not make it necessary to develop enrichment facilities and it would not require the development of a radiochemical industry. If the scale of energy production in the next 100 years is increased, then it will make sense to discuss these other issues. I think that cooperation with neighboring countries is going to be very beneficial, because what we're talking about is a very costly project.

PNS: Nicolai, would you like to comment on the Ukrainian situation?

Steinberg: I don't think I can add anything to what has just been said. There has not been any official statement made about the creation of a closed fuel cycle in Ukraine, if we don't take into account Mr. Umanets' [chairman of the State Committee for Use of Atomic Energy] statement last spring. But we cannot really treat that as a serious statement. The only official statement was that made by the president in his decree on the need to develop a fuel cycle. And it doesn't specifically say a closed fuel cycle.

The only thing we can speak about today is the development of fuel production, which is to say that enrichment facilities will not be built in Ukraine, at least in the foreseeable future. To say anything about the processing of spent fuel is unthinkable in Ukraine's current economic situation. Further, the situation in the world is such that four major centers of reprocessing have been evolving: England, France, Japan, and Russia. The existing capacity is sufficient to process all spent fuel. And from my point of view, it would be dangerous to set up any other processing centers, because we are talking about issues involving plutonium and the NPT.

PNS: This leads to another issue, and that has to do with the implementation of the Trilateral Statement, particularly the receipt of fresh fuel from Russia. From your perspective is the Statement being implemented on schedule? Is Ukraine receiving the fresh fuel?

Steinberg: As far as I know, there have been no major problems. I cannot say anything in greater detail because I have nothing to do with this statement.